



**ADMINISTRATIVE RECORD
MATTEO IRON AND METAL SITE**

WEST DEPTFORD, GLOUCESTER COUNTY, NJ

Prepared for:

U. S. EPA Region II
Removal Action Branch
Edison, New Jersey 08837

Prepared by:

Region II Removal Support Team
Weston Solutions, Inc.
Federal Programs Division
Edison, New Jersey 08837

DCN #: RST-02-F-02021
TDD #: 02-06-02-0015
EPA Contract No.: 68-W-00-113

March 2006

Administrative Records in Local Repositories

The "Administrative Record" is the collection of documents which form the basis for the selection of a response action at a Superfund site. Under Section 113(k) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), the EPA is required to establish an Administrative Record available at or near the site.

The Administrative Record file must be reasonably available for public review during normal business hours. The record file should be treated as a non-circulating reference document. This will allow the public greater access to the volumes and also minimize the risk of loss or damage. Individuals may photocopy any documents contained in the record file, according to the photocopying procedures at the local repository.

The documents in the Administrative Record file may become damaged or lost during use. If this occurs, the local repository manager should contact the EPA Regional Office for replacements. Periodically, the EPA may send supplemental volumes and indexes directly to the local repository. These supplements should be placed with the initial record file.

The Administrative Record file will be maintained at the local repository until further notice. Questions regarding the maintenance of the record file should be directed to the EPA Regional Office.

The Agency welcomes comments at any time on documents contained in the Administrative Record file. Please send any such comments to Nick Magriples, Removal Action Branch, U.S. EPA Region II, 2890 Woodbridge Avenue, Edison, NJ 08837.

For further information on the Administrative Record file, contact Nick Magriples, On-Scene Coordinator, U.S. EPA Region II, at (732) 906-6930.

GENERAL ADMINISTRATIVE RECORD CONTENTS

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- 1.3 Preliminary Assessment (PA) Report
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- 2.4 EE/CA (for non-time critical removals)
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- 2.9 Sampling and Analysis Reports/Trip Reports

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- 3.2 Trip Reports/ Chain of Custody Forms
- 3.3 Work Plan
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- 8.2 Toxicological Profiles
- 8.3 Ecological Risk Assessment

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- 10.3 Public Notice(s) (Availability of the Administrative Record, File, Availability of the Proposed Plan, Public Meetings)
- 10.4 Public Meeting Transcripts
- 10.5 Documentation of Other Public Meetings
- 10.6 Fact Sheets and Press Releases
- 10.7 Responsiveness Summary
- 10.8 Late Comments

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- 11.3 State Guidance
- 11.4 Technical Source

MATTEO IRON AND METAL SITE
ADMINISTRATIVE RECORD FILE

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MATTEO IRON AND METAL SITE
ADMINISTRATIVE RECORD FILE

MODEL INDEX OF DOCUMENTS

The index of documents contains the following information about each document:

Document #: Site Code (three letters of site name)-Section, First Page-Section - Last Page
EXAMPLE (MIM1.10001 - 1.10002)

Title: Abstract of Document Contents

Category: Document Category/Section of Administrative Record File

Author: Writer and affiliation

Recipient: Addressee or Public and Affiliation, if applicable

Date: When document was created or transmitted

Note: Items in the Administrative Record are for public access, and should be removed from the file only for copying. The cost of reproduction of the documents in the file is the responsibility of the person requesting the copy.

MATTEO IRON AND METAL SITE
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

Document #: MIM1.10001
Title: Memorandum
Category: Site Investigation
Author: Frank Hartman, States of New Jersey, Department of Environmental Protection
Recipient: File
Date: April 1, 1975

Document #: MIM1.10002 - 1.10004
Title: Hazardous Waste Investigation
Category: Site Investigation
Author: William Lowry, Inspector, Environmental Specialist
Recipient: NJDEP - File
Date: April 28, 1983

Document #: MIM1.10005
Title: Memo, James Matteo & Sons, Inc.
Category: Site Investigation
Author: William Lowry, Inspector, Environmental Specialist, NJDEP
Recipient: David Potts
Date: May 20, 1983

Document #: MIM1.10006 - 1.10010
Title: Waste Management Investigation
Category: Site Investigation
Author: M. Tompkins/B. Venner
Recipient: NJDEP - File
Date: May 22, 1984

Document #: MIM1.10011 - 1.10013
Title: Complaint Report
Category: Site Investigation
Author: Bill Hinshillwood, Local Health Department Representative, Gloucester County Health Department, Woodbury, New Jersey.
Recipient: File
Date: March 25, 1983

Document #: MIM1.10014
Title: Response to letter of September 6, 1984
Category: Site Investigation
Author: Shirlee Schiffman, Acting Chief, Bureau of Hazardous Waste, Classification and Manifest
Recipient: Mr. James F. Matteo, President, James Matteo & Sons, Inc., 1708 Route US #130, Thorofare, New Jersey 08086.
Date: December 18, 1984

Document #: MIM1.10015 - 1.10018
Title: Investigation (Initial), File #: 08-20-07
Category: Site Investigation
Author: Robert T. Gomez, NJDEP, Division of Hazardous Waste Management
Recipient: File
Date: January 15, 1991

Document #: MIM1.10019 - 1.10023
Title: Investigation (Follow up), File #: 08-20-07
Category: Site Investigation
Author: Robert T. Gomez, NJDEP, Division of Hazardous Waste Management
Recipient: File
Date: March 11, 1991

Document #: MIM1.10024 - 1.10026
Title: Investigation, File #: 08-20-07
Category: Site Investigation
Author: Robert T. Gomez, NJDEP, Division of Hazardous Waste Management
Recipient: File
Date: May 21, 1991

Document #: MIM1.10027 - 1.10029
Title: Followup Investigation, File #: 08-20-07
Category: Site Investigation
Author: Nick Sodano, NJDEP, Division of Hazardous Waste Management
Recipient: File
Date: January 14, 1992

Document #: MIM1.10030 - 1.10032
Title: Follow-up Investigation, File #: 08-20-07
Category: Site Investigation
Author: Nick Sodano, New Jersey Department of Environmental Protection, Division of Responsible Party Site Remediation
Recipient: File
Date: January 15, 1992

Document #: MIM1.10033
Title: February 26, 1992 - Analytical Data Table
Category: Site Investigation
Author: Nick Sodano, New Jersey Department of Environmental Protection and Energy
Recipient: Mr. Matteo, 1708 U.S. Route 130, Thorofare, NJ 08086
Date: May 28, 1992

Document #: MIM1.10034
Title: Letter
Category: Site Investigation
Author: Louis D. Fletcher, Falciani & Falciani, Attorneys At Law, Woodbury, NJ 08096

Recipient: Mr. Wes Hendricks, State of NJ Environmental Protection Energy, Division of Responsible Party Site Remediation, Trenton, NJ 08625-0028

Date: May 17, 1993

Document #: MIM1.10035 - 1.10039

Title: Memorandum

Category: Site Investigation

Author: Thomas J. Cozzi, Section Chief, Bureau of Site Management, NJDEP

Recipient: Kenneth J. Klou, Section Chief, Site Assessment/Environmental Measurements Section, NJDEP

Date: January 22, 1996

Document #: MIM1.10040

Title: Record of Telephone Discussion

Category: Site Investigation

Author: Nick Sodano, New Jersey Department of Environmental Protection

Recipient: Colleen Beers, Heather-Willow Trailer Park, US Route 130, Crown Point Road.

Date: April 29, 1996

Document #: MIM2.10001 - 2.10107

Title: Quality Assurance Project Plan, Matteo Iron and Metal Site, West Deptford, Gloucester County, New Jersey.

Category: Removal Response

Author: Aaron Levy, Site Project Manager, Weston Solutions Inc., Removal Support Team, Edison, NJ

Recipient: Mr. Nick Magriples, On-Scene Coordinator, U.S. Environmental Protection Agency, Region II, Edison, New Jersey

Date: April 26, 2005

Document #: MIM2.20001 - 2.20057

Title: Pesticide/PCB's, CLP Data Assessment - Matteo Iron and Metal Site

Category: Removal Response

Author: Habteab Ghebreyesus, Data Reviewer's

Recipient: File

Date: June 30, 2005

Document #: MIM2.20058 - 2.20210

Title: XRF Analysis Report - Matteo Iron and Metal Site, West Deptford, Gloucester County, New Jersey.

Category: Removal Response

Author: Michael Mahnkopf, Site Project Manager, Weston Solutions Inc., Removal Support Team, Edison, NJ

Recipient: Mr. Nick Magriples, On-Scene Coordinator, U.S. Environmental Protection Agency, Region II, Edison, New Jersey

Date: June 29, 2005

Document #: MIM2.50001 - 2.50023
Title: Action Memorandum, Request for Authorization for a CERCLA Removal Action at the Matteo Iron and Metal Site, West Deptford, Gloucester County, New Jersey
Category: Removal Response
Author: Nick Magriples, On-Scene Coordinator, Removal Action Branch, U.S. Environmental Protection Agency, Region II, Edison, NJ
Recipient: George Pavlou, Director, Emergency and Remedial Response Division, US EPA, Region II, New York, NY
Thru: Richard C. Salkie, Chief, Removal Action Branch
Date: September 30, 2005

Document #: MIM2.90001 - 2.90035
Title: Sampling Trip Report - Matteo Iron and Metal Site
Category: Removal Response
Author: Aaron Levy, Site Project Manager, Weston Solutions Inc., Removal Support Team, Edison, NJ
Recipient: Mr. Nick Magriples, On-Scene Coordinator, U.S. Environmental Protection Agency, Region II, Edison, New Jersey
Date: May 12, 2005

Document #: MIM3.40001 - 3.40211
Title: Final Remedial Investigation Report, Matteo Iron and Metal Site, West Deptford, New Jersey.
Category: Remedial Investigation
Author: The Louis Berger Group, Inc., 30 Vreeland Road, Florham Park, New Jersey 07932
Recipient: State of New Jersey, Department of Environmental Protection, 401 East State Street, Trenton.
Date: May 2004

Document #: MIM3.40212 - 3.40259
Title: Final Aquatic Biota Study Report, Matteo Iron and Metal Site, RI/RAS Term Contract No. A-47449
Category: Remedial Investigation
Author: Thomas G. Lewis, P.E., J.D., Program Manager
Recipient: Mr. Larry Quinn, Project Manager, New Jersey Department of Environmental Protection, Division of Remediation Management and Response, 401 East State Street, PO 413, Trenton, NJ 08625
Date: December 30, 2004

Document #: MIM6.30001
Title: Matteo Iron and Metal Site
Category: State Coordination
Author: Carlton W. Bergman, Bureau of Design and Construction, State of New Jersey, Department of Environmental Protection, Division of Remediation Management and Response, 401 E. State Street, PO Box 413, Trenton, NJ
Recipient: Richard Salkie, Chief, Removal Action Branch, USEPA Region II
Date: February 2, 2005

Document #: MIM6.30002 - 6.30003

Title: Matteo Iron and Metal Site - CERCLA removal action consideration.

Category: State Coordination

Author: Leonard J. Romino, Acting Director, Division of Remediation Support, State of New Jersey, Department of Environmental Protection.

Recipient: William McCabe, Acting Director, Emergency and Remedial Response Division, US. Protection Agency, Region II, 290 Broadway, New York, New York 10007-1866

Date: June 6, 2005

Document #: MIM8.30001 - 8.30109

Title: Ecological Risk Assessment, Final Report, Matteo Iron and Metal Site, West Deptford, New Jersey.

Category: Health Assessments

Author: Karen Kracko, Task Leader, Lockheed Martin/REAC.

Recipient: Mark D. Sprenger, PhD, Work Assignment Manager, EPA/ERT

Date: July 14, 2005

Document #: MIM10.30001

Title: Notice of Public Availability

Category: Public Participation

Author: United States Environmental Protection Agency, Region II, Edison, NJ

Recipient: General Public

Date: March 2006

Document #: MIM10.60001-10.60005

Title: Press Releases

Category: Public Participation

Author: NJ Office of Governor

Recipient: General Public

Date: April 22, 2005

Document #: MIM11.20001-11.20002

Title: EPA Regional Guidance Documents

Category: Technical Source and Guidance Documents

Author: United States Environmental Protection Agency, Region II, Edison, NJ

Recipient: General Public

Date: None Given

ADDITIONAL INFORMATION:

The following documents are included in the Site project file and may be viewed by contacting Nick Magriples, On-Scene Coordinator, U.S. EPA Region II, at (732)906-6930.

1. NJDEP Final Remedial Investigation Report - May 2004
The Appendices are not included in the Admin. Record for these reports, but are available for review in the Site project file.
2. NJDEP Final Aquatic Biota Study Report - December 2004
The Appendices are not included in the Admin. Record for these reports, but are available for review in the Site project file.
3. NJDEP Final Remedial Action Selection Evaluation Report - June 2005
Available for review in the Site project file.
(Submitted By: The Louis Berger Group, Inc., 30 Vreeland Road, Florham Park, New Jersey 07932. Submitted To: State of New Jersey, Department of Environmental Protection, 401 East State Street, Trenton, New Jersey.)

FINAL REMEDIAL ACTION SELECTION EVALUATION REPORT

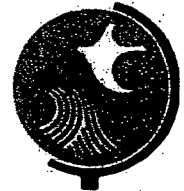
MATTEO IRON AND METAL

West Deptford, New Jersey

Remedial Investigation and Remedial Action Selection Evaluation

Statewide Contract Number A-85149

Submitted to:



STATE OF NEW JERSEY
Department of Environmental Protection
401 East State Street,
Trenton, New Jersey

Submitted by:



The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, New Jersey 07932

June 2005

M E M O R A N D U M

State of New Jersey
Department of Environmental Protection

TO: File

FROM: Frank Hartman

DATE: April 1, 1975

SUBJECT: Complaint concerning crushed washed battery cases behind Matteo junk yard by Joseph A Sturek, Code Enforcement Officer from West Deptford Township. Matteo junk yard (Block 128, Lots 2, 2A) is on Route 130 in West Deptford Township.

Current Status - 3/25/75

On the above date I and Mr. Sturek went to Matteo junk yard and contacted Mr. James Matteo, part owner. We went to the area in question (the battery cases); Mr. Matteo stated that these crushed washed battery cases were for use in driveway and roadbeds and were sold as such. I stated that he shall have to move them to an area away from the stream, pick up any battery cases in the water, and cover over were needed.

I also stated that we will be back in 15 days.

FH:bd

ATTACHMENT I

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HAZARDOUS WASTE INVESTIGATION

HW/EF # 08-20-07

Inspector: William Lowry Date: 4/28/83 Time: 11:00
Business Name: James Matteo & Sons, Inc. Telephone: 609-845-0398
(Location)
Street: 1708 Rt. 130
Town: Thorofare
County: Gloucester
Lot: 2 -- (36.2 acres) Block: 325 Type Ownership: Corporate
Property Owner:
James Matteo & Sons
(same)

Local Health Dept. Representative Contacted: Bill Hinshillwood
Date: 4/28/83 Time: 11:00 Affiliation: Health Department
Origin of Complaint: Follow-up
Complaint:
Findings:

On the above date, I met with Bill Hinshillwood and Carolyn Grasso, Gloucester County Health Department. Prior to entering the site, Mr. Hinshillwood indicated that a white powder substance had been observed at the site by the Health Department. The purpose of today's site visit was to confirm property ownership, identify a responsible party for the deposited white powder and to continue the investigation concerning the nine drums on site as discussed in the 2/1/83 memo by this writer (see file).

We met with Mr. Walter Emery, Manager of the Trailer Park. Mr. Emery went with us to the area behind the Trailer Park. After pointing out the drums and the white powder in question to Mr. Emery, he stated that this property was not part of the Trailer Park. He stated that because of the access to the site, random dumping occurs and he could not assist us in identifying the drums of powder. According to Mr. Emery, this property is owned by the Matteo Bros., who operate a junk yard next door. At this point we thanked Mr. Emery for his assistance. I also indicated to Mr. Emery that the original complaint by Mr. Stambanger alleging that illegal dumping behind the Trailer Park was causing excessive flooding was no longer being pursued by DWM Field Operations. Both Mr. Hinshillwood & myself concurred that the flooding was being caused by something other than any dumping occurring at this location.

We then proceeded to the Thorofare Municipal Building to document property ownership. There it was confirmed that Block 325, Lot 2 was the property in question and that James Matteo & Sons, Inc., is the current property owner.

Upon arrival at Matteo Bros., we met with Mr. Jim Matteo. I explained the purpose of our visit and Mr. Matteo was very cooperative in providing information. Mr. Matteo explained that the property was never used as part of the junk yard business. The site was previously used as a vegetable farm. At some point the land was rented to Pat and Joe Matteo, who lived in a house which is no longer standing. According to Jim, Pat & Joe operated Thorofare Trash & Trucking Company from this site. They later moved the business across Route 130 to another house

ATTACHMENT P1

Hazardous Waste Investigation
Inspector: William Lowry

Page 2


which is visible from the junk yard. Mr. Matteo also stated that he operates an incinerator at the junk yard to remove wire insulation for copper recovery. He further stated that the resulting incinerator ash is dumped at another location. At the same site, he then showed us an area used for the ash disposal. What appeared to be three loads of incinerator ash were observed. Mr. Matteo was then shown the drums in question. He stated he was not aware that they had been there and could provide no information as to their origin or content.

At this point, we returned to the junk yard office. Mr. Hinshillwood stated he would interview Pat & Joe Matteo (Thorofare Trucking) regarding the deposit of the white powder. Ms. Grasso and this writer then departed for Monsanto Company for a scheduled inspection.

On 4/29/83 at 1530 hours, Mr. Hinshillwood contacted the writer at Red Lion to report his findings at the interview. He was told that the white powder in question was hauled by Thorofare Trash Company. According to those interviewed, the material was picked up at New Jersey Zinc in Gloucester City and that the material was a waste from a fertilizer production process. No analysis of the material was available.

Photographs:

Two photos of the white powder deposits and two photos of the incinerator ash were taken.


William Lowry
Environmental Specialist

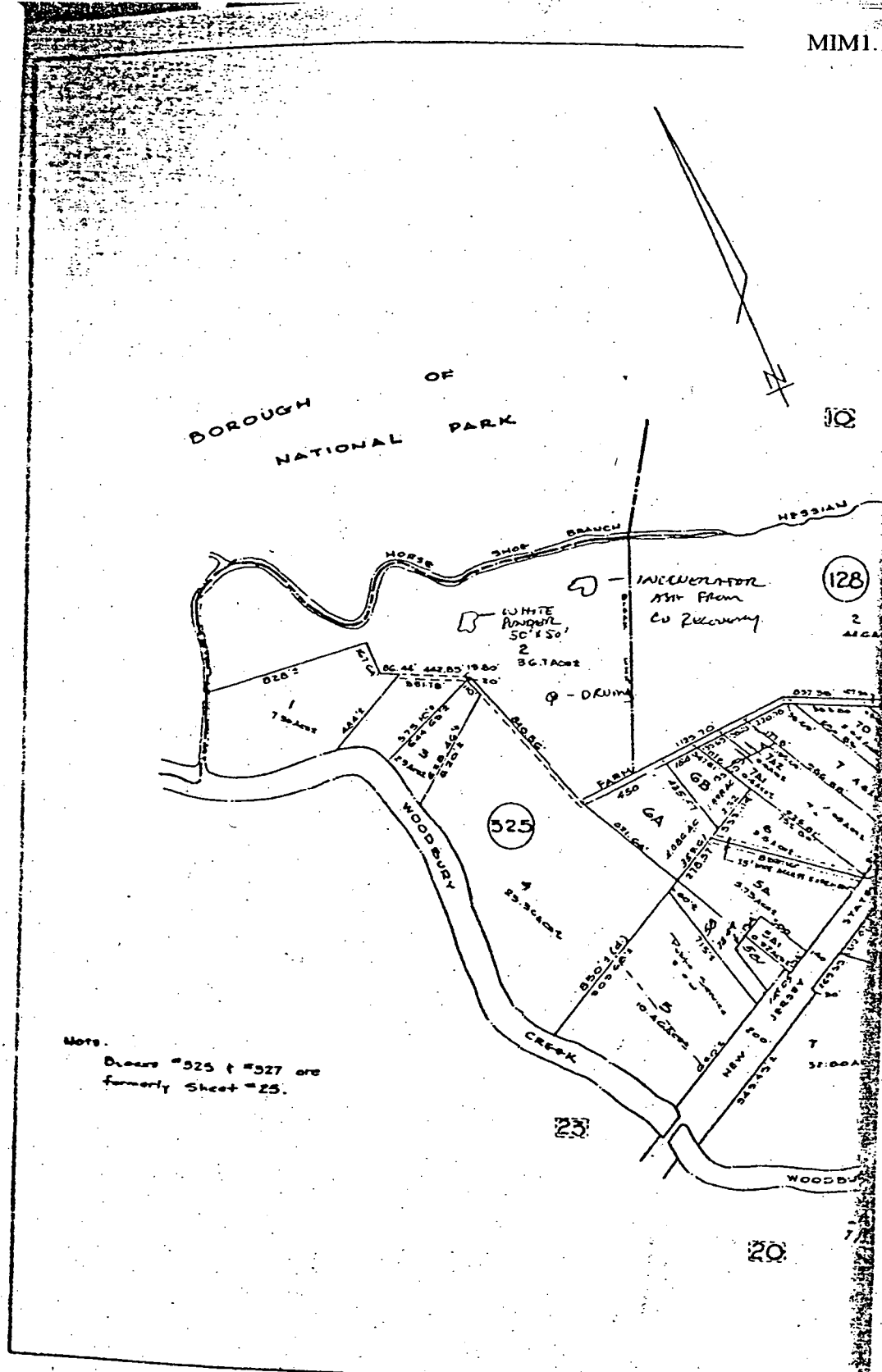
WL:lk

cc: Mr. Bill Hinshillwood
Gloucester Co. Health Department
Carpenter Street & Allens Lane
Woodbury, New Jersey 08096

04-14-01

08-20-09

ATTACHMENT P2



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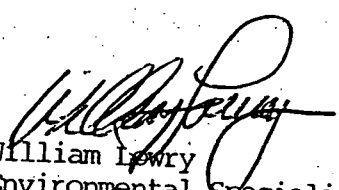
MEMONEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO David Potts
FROM William Lowry DATE 5/20/83
SUBJECT James Matteo & Sons, Inc.

Based on my findings, I recommend that an administrative order be issued to this Company requiring the following:

- 1) Immediately cease disposal of incinerator ash on Block 325, Lot 2 -- \$100.00 Penalty Assessment -- arrange for excavation and disposal at approved facility. **
- 2) Sample and analyse the white powder substance and submit report to D. Schrier for classification -- then remove material to an approved disposal facility.
- 3) Sample and analyse drums found at property and submit report to D. Schrier for classification. Remove material to an approved disposal facility.

Further investigation into disposal of fertilizer waste may be warranted. New Jersey Zinc was contacted by me on 5/20/83. I spoke with a Mr. Peterson who stated that he was not aware of involvement with Thorofare. He will * discuss with a Mr. Foust, Environmental Supervisor and get back to me if they have any further information.


William Lowry
Environmental Specialist

WL:lk

cc.

** (1) see Hartman for citation
IE ID27 Waste

ATTACHMENT Q1

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WASTE MANAGEMENT INVESTIGATION

Case #: 84-5-21-35Inspector: TCIMPKINS/VENNER Date: 22nd MAY 1984 Time: 1530 HRSBusiness Name: JAMES MATEO & SONS INC. Telephone: _____
(Responsible Party)SPILL LOCATIONStreet: OFF 295/130 STown: THOROFARE, W. DEPTFORDCounty: GLOUCESTERLot: 2 Block: 325 Type Ownership: CORP.Local Health Department Representative Contacted: MS RITA LEZENBYDate: 5/22/84 Time: 1530 HRS Affiliation: G.C.H.D.Origin of Complaint: OPERATOR #9Complaint: FIRE BEHIND HEATHERWOOD TRAILER PARK

Findings: AT APPROX 1530 HRS, BRUCE VENNER (DEP-OWM) & I ARRIVED AT THE GLOUCESTER COUNTY HEALTH DEPT. & MET WITH RITA LEE TO DISCUSS YESTERDAYS FIRE AT THE MATEO PROPERTY BEHIND THE HEATHERWOOD TRAILER PARK. MS. LEZENBY INFORMED US THAT THE FIRE APPEARED TO BE THE RESULT OF A POLYPROPYLENE-LIKE MATERIAL BURNING. THE MATERIAL COULD NOT BE EXTINGUISHED WITH WATER, SO FOAM WAS APPLIED. SHE ALSO INFORMED US OF A RUMOR THAT DEP-OWM WAS PERFORMING SOME TYPE OF SURVEILLANCE ON THE PROPERTY, & TO GET RID OF THE MATERIAL IN QUESTION, A FIRE WAS STARTED TO DISPOSE OF IT. ACCORDING TO MS. LEZENBY, THE RUMOR MAY HAVE COME FROM THE FIRE MARSHALL, JOHN CASSANO

INVESTIGATIVE REPORT
NARRATIVE

BUSINESS NAME JAMES MATEO & SONS INC. DATE 5/22/84
LOCATION THOROFARE, W. DEPTFORD TIME 1530 HRS
CASE NUMBER 84-S-21-83

AFTER REQUESTING A COPY OF HER FILE, AS WELL AS THE
NEWSPAPER CLIPPINGS, THE FOLLOWING INVESTIGATION WAS PERFORMED
1600HRS - BRUCE VANNER & I ARRIVED ON SITE & OBSERVED THE AREA
OF THE FIRE. WE BEGAN TO WALK THE PERIMETER OF THE BURN SITE.

NOTE THAT THERE IS AN ODOUR (LIGHT) OF BURNED PLASTIC.
1608HRS - WE OBSERVE AN EXCAVATED HOLE MEASURING APPROX 8' x 10'. IN
THIS HOLE WE NOTE EVIDENCE OF BURIED DRUMS, A YELLOW MATERIAL,
WHAT APPEARS TO BE EXTRUDED PLASTIC & OTHER DEBRIS. THIS HOLE
APPEARS TO HAVE BEEN DUG AFTER THE FIRE. 3 PHOTOS TAKEN.

1610HRS - 1 PHOTO IS TAKEN OF FILLED IN EXCAVATION & TWO PHOTOS
TAKEN OF WHAT APPEARS TO BE CHUNKS OF MELTED PLASTIC. IN
ADDITION, THE SOUTHERN SECTION AS WELL AS OTHER SCATTERED SEC-
TIONS OF THE BURN APPEAR TO BE COVERED WITH A SKIN OF
POSSIBLY MELTED PLASTIC.

1615HRS - 4 PHOTOS ARE TAKEN PANNING THE BURN SITE. NOTE THAT AN
AREA WITHIN THE BURN IS OBSERVED TO CONTAIN A WHITE POWDER
ON THE GROUND SURFACE. A SAMPLE OF THIS MATERIAL WAS TAKEN
BY BRUCE VANNER (BV-028). ALSO AT THIS TIME TWO BOYS
ON BICYCLES ARRIVE (RAY WILKINSON AGE 14 & JOE D'AMICO AGE 18),
BOTH REQUESTING I ACCOMPANY THEM ON A TOUR OF THE AREA WHILE
BRUCE TAKES THE SAMPLE OF THE POWDERED MATERIAL.

1650HRS - ONE PHOTO IS TAKEN OF A DRUM CONTAINING A TURQUOISE
COLORED SOLID.

1700HRS - ONE PHOTO IS TAKEN OF DRUMS ALONG THE RIVER BANK. THOU-
SANDS OF CRUSHED BATTERY BOXES ARE NOTED IN THIS AREA.

1705HRS - ONE PHOTO IS TAKEN OF AN APPROX 4" O.D. RUBBER HOSE WITH
METAL COUPLINGS.

1725HRS - ONE PHOTO IS TAKEN OF AN EXCAVATED HOLE & ONE PHOTO IS

ATTACHMENT T2

Pg. #2

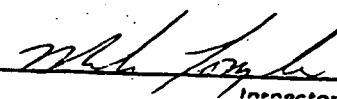
Inspector

INVESTIGATIVE REPORT
NARRATIVEBUSINESS NAME JAMES MATEO & SONS INC.DATE 5/22/84LOCATION THORAPARK W. OERTULOTIME 1530 HRSCASE NUMBER 84-5-21-35

TAKEN OF 55 GAL DRUMS ON THEIR SIDE, DUMPED JUST OFF THE
DIRT ROAD UNDER A TREE.

ALL THE DRUMS PHOTOGRAPHED APPEARED TO BE UNMARKED, SOME
IF NOT ALL HAVE BEEN HERE FOR SOME TIME. IN ALL, BETTER TO
TWO DOZEN DRUMS HAVE BEEN NOTED EITHER ON TOP OF THE GROUND
OR PARTIALLY BURIED.

FINALLY THE TERRAIN OF THE AREA, THOUGH VEGETATIVE COVERED
AT THIS TIME, APPEARS THAT IT HAS BEEN DISTURBED OVER THE YEARS,
POSSIBLY INDICATING PREVIOUS LANDFILLING.

ATTACHMENT T3
Investigator

partially exposed drums
in what appears to be
an old working face

shoreline in this approx. area
is covered with crushed
battery cases
the upper shoreline and much
of wooded area containing an
undetermined number of
deteriorating steel drums

this area appears
to have been filled.

old fire site

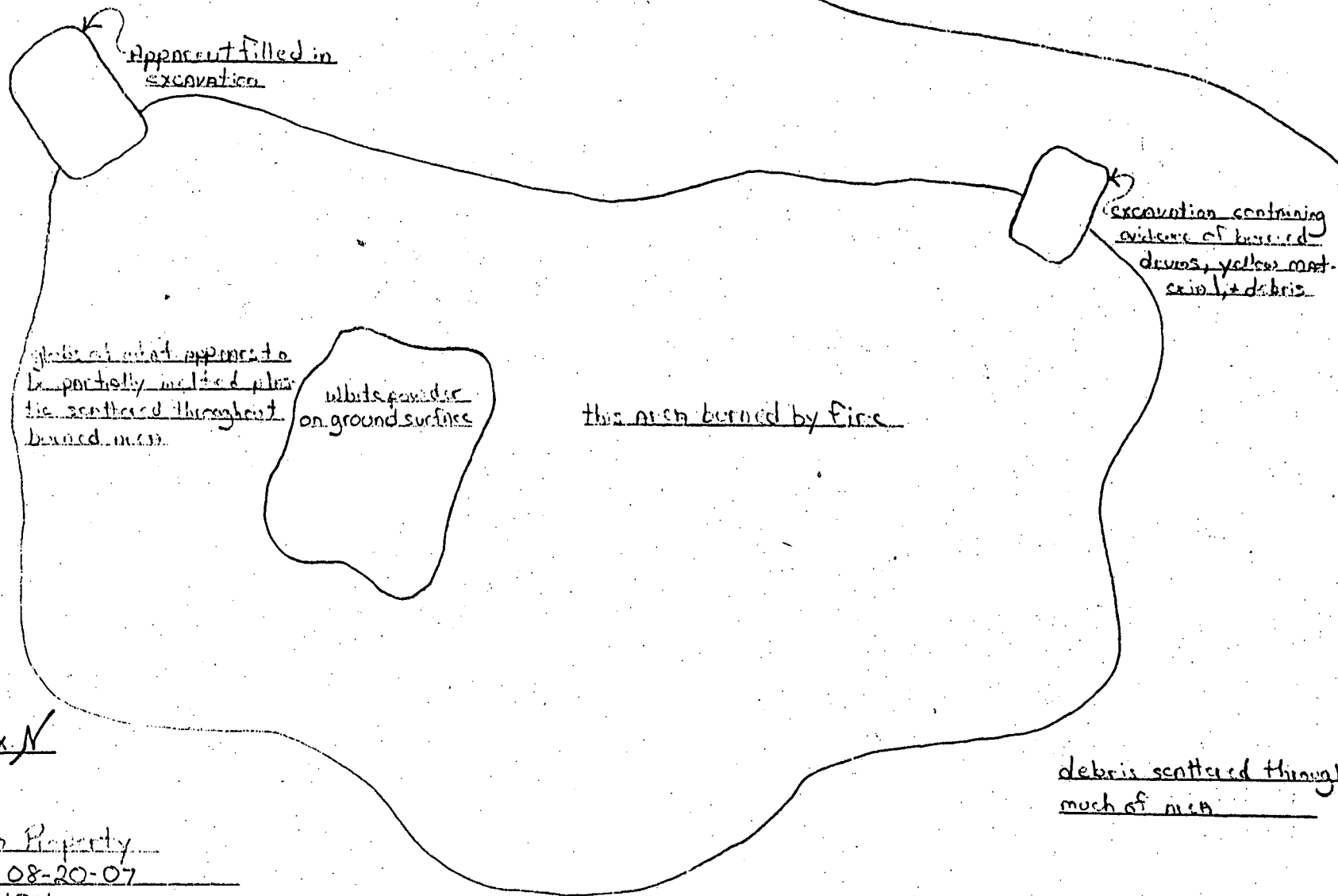
↑ tree line

old box cars
+ vehicles in the
area.

Dict reads

Approx N

Matted Property
File # 08-20-07
5/22/84
not drawn to any scale
B. Vanner / M. Tompkins



Approx. N

Matter Property
 File # 08-20-07
 5/22/87
 not drawn to any scale
 B. Vetter / M. Tompkins
 drawing in

to timber park (dirt road)



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COMPLAINT REPORT

Recd
May 19
Recd 6-27-83

DATE 3/25/83

LOCATION OF COMPLAINT MUNICIPALITY
 Behind Heatherwood Mobile Home Park

RESPONSIBLE PARTY

Name

Address

Telephone

Owner
Tenant

COMPLAINT

Thermostat in kitchen in 55 gal. drum
 removed & replaced in glassed surface

COMPLAINANT

Name

Address

Telephone

ACTION TAKEN

3-26-83 spoke with Mr. Hill. He indicated area is
 Behind Heatherwood MHP. This site has previously been
 investigated by DEP - Waste Mgmt. They are
 conducting analysis of drums.

SANITARIAN

W. Hunsellwood

DATE

DATE

GC1183

No further action
 Referred to DEP

DATE 3-28-84

05829

ATTACHMENT N1

3-30-83 Check of site revealed several areas where a whitish powder and solid white chunks of material were noted dumped. Material appears to have been dumped over an extended period of time. Will contact DEP. Waste Mgmt re. sampling. No evidence of recent drum dumping noted.

3-30-83 Spoke with Bill Lavy, DEP. Reported spill. He will arrange investigation for 4-5-83.

4-5-83 Spoke with Bill Lavy. He is unable to check site on this date. Will reschedule.

4-7-83 Left message with DEP office for Bill Lavy to call back.

4-22-83 No evidence of further dumping.

4-28-83 Inspection of site

Bill Lamy, DEP. Owner of property identified as Matteo Bros. Property was leased to Thorofare Trash Co. Rep. of co. stated white material was waste fertilizer from ~~American~~

N.J. Zinc, Gloucester NJ. DEP will pursue cleanup action.

6-28-83 - ^{approx} cleanup action begins this date (B)

Plant trash up until 1982.

Titanium dioxide mixed in.

from Gulf + Western Gloucester NJ

5-27-83 Info. on material dumped at site referred to DEP-Waste Mgmt. They will cite Matteo to cleanup. No further action necessary.

9-2-83 No progress noted in cleanup. Will check with DEP. WH

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State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
32 E. Hanover St., CN 028, Trenton, N.J. 08625

MARWAN M. SADAT, P.E.
DIRECTOR

LINO F. PEREIRA, P.E.
DEPUTY DIRECTOR

December 18, 1984

Mr. James F. Matteo, President
James Matteo & Sons, Inc.
1708 Route US #130
Thorofare, New Jersey 08086

Dear Mr. Matteo:

In response to your letter of September 6, 1984 for a Departmental opinion on the classification of incineration ash, waste fertilizer and drummed material, please be advised that wastes which conform with the representative sample that provided the basis for data submitted to the Department are classified as industrial waste (I.D. #27) pursuant to the rules of the Division of Waste Management. Wastes conforming with the characteristics of the representative samples must be disposed at the facility authorized to accept industrial waste (I.D. #27) in accordance with the State waste flow rules as contained in N.J.A.C. 7:26-6 et seq.

Be further advised that this letter constitutes merely an advisory opinion on the applicability of current New Jersey waste classification standards to a specific representative sample of a waste stream. It expresses no opinion regarding any particular waste shipment to the extent that its characteristics and content differ from the representative sample of a waste stream.

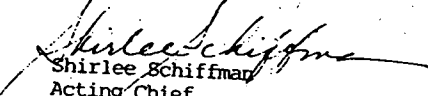
Moreover, because the Department has not examined, inspected or analyzed the wastes you propose to dispose, as represented in your letter of September 6, 1984, this response does not constitute any representation as to the actual chemical composition of said material.

Accordingly, prior to disposal of this waste, you may wish to contact the selected disposal facility to establish an analytical protocol which will satisfy all concerned parties that current regulations allow for such disposal.

-2-

Should you have any further questions regarding this matter, please contact Mr. David Schrier of my staff at (609) 292-8341.

Very truly yours,


Shirlee Schiffman
Acting Chief
Bureau of Hazardous Waste
Classification and Manifest

PR14:bag
cc: Mr. Ron Corcoery
Mr. Edward Londres
Mr. Barry Frasco

ATTACHMENT **W**

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INVESTIGATION
(Initial)

Page 1 of 4

CASE #: 91-01-11-SF01s

FILE #: 08-20-07 PAC #: PTP-A

INVESTIGATOR: Robert T. Gomez

DATE: January 15, 1991

LOCATION: Matteo Property

TIME: in- 1030 out- 1530

ADDRESS: 1708 Rt. 295/130

OWNER: Matteo Scrap Yard

Thorofare, NJ 08086

ADDRESS: Same

COUNTY: Gloucester

BLOCK: 303

LOT: 2

RP: Same

LOCATION TELEPHONE: 609-845-0398

ADDRESS: Same

EPA ID #: NA

LOCAL HEALTH REP: Don Schneider

TELEPHONE: 609-853-3411

COMPLAINANT: Anonymous

TELEPHONE: Anonymous

NATURE OF COMPLAINT: Possible illegal dumping of batteries and paint waste.

PHOTOGRAPHS: Yes (9)

SAMPLE #: NA

FINDINGS:

On 1-11-91 I received a call from an anonymous person who stated illegal dumping of batteries and paint waste had occurred behind the Crown Point Truck Stop. This anonymous caller said he had installed an underground natural gas pipeline through the property behind the truck stop, that went into Coastal Refinery. As the caller was excavating soil for the gas line he uncovered crushed battery cases, and crushed and partially crushed 55 gallon drums. This caller also stated he was exposed to what he thought smelled like acid vapors during the excavation/installation of the natural gas line.

This anonymous caller stated that he had worked on this project for several months. Since that time the caller said he has experienced irregular nose bleeds. The caller is afraid he has been exposed to hazardous substances during the installation of the gas pipeline. He wanted someone to investigate the site so he would have some legal recourse against his employer if he was exposed to hazardous substances, and his condition got worse. The company that he works for is RA Hamilton located at 409 S. River St., Hackensack, NJ. The job foreman was Mike Ferrante, 201-641-4000.

On 1-15-91 I investigated the above complaint. I asked an employee at the Crown Point Truck Stop who owned the property behind the truck stop, I was told that Matteo Scrap Yard owned that property. Behind the truck stop there is a dirt road along side some fuel tanks, this road goes through woods and opens up to a large dirt field, where there are several small patches of wooded areas. The dirt road more or less is in the middle of the dirt field.

There appeared to be various areas of potential environmental concern located throughout this site, highlighted in red on the site map. Back near the rear gate of the scrap yard was an area approximately 15 ft. in circumference where something had been burned at some point in time, possibly rubber tires. There was a black sludgy material on the surface of the soil and stressed vegetation in this area (see photo 2A). Photograph 3A was taken of a clump of whitish/yellow, solid material. All along the patch of woods where

ATTACHMENT 21

Robert Gomez

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

INVESTIGATION
(Initial)

Page 2 of 3

Case #: 91-01-11-SP01s

Date: January 15, 1991

SUMMARY:

where photo 3A was taken were clumps of this whitish/yellow, solid material. To me, this whitish/yellow, solid material looked like metal salts you would find on the end of car battery terminals. Also in this area there appeared to be clumps of various colored paint pigments spread across the soil.

Back in the area near where the pipeline went into the marsh is where the anonymous caller stated he encountered a lot of buried debris, crushed 55 gallon drums, and what he thought smelled like acid vapors. Between this area and the small patch of woods towards the dirt road that led out to Crown Point Truck Stop, was an area that contained debris, solid chunks of plastic that looked as if it hardened in a 55 gallon drums, because of its shape. Also were small plastic pellets that looked like polypropylene pellets scattered on the soil.

Photograph 5A is a photo of a partially crushed 55 gallon drum, whose contents, an orangeish/white, solid material was spilling onto the soil. Photograph 1A was taken of a yellow and white solid material that was spread all around a tree, near the northeast corner of the dirt field. Just to the west of this tree, where the natural gas pipeline goes through the woods was a groundhog hole, photograph 12B. The top six inches of soil which the groundhog hole passes through is a solid yellow material.

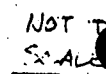
As I went further into the woods past the groundhog hole, along the pipeline, I saw two areas (photo's 9B & 10B), opposite the groundhog hole, where there appeared to be melted plastic. The vegetation was stressed in this area.

As I was investigating the Matteo Property I saw a man loading a piece of heavy construction equipment onto a flatbed truck. I asked if he had worked on this site, he replied no, but gave me directions as to where I could find Mike Ferrante, the job foreman. I met Mr. Ferrante and asked him what he knew about the natural gas pipeline installed through the Matteo Property; did he know anything about buried drums, or did any of his employees smell odd odors. Mr. Ferrante stated that his employees uncovered crushed drums, bottles, and broken battery cases, in addition to other debris. I asked about any unusual odors, he replied possibly methane gas from decomposition, because the area was very close to the marsh.

I then went to the Matteo Scrap Yard office and was met by Jim Matteo, one of the owners of the scrap yard. I explained to Mr. Matteo why I was there and took him to the above areas of potential environmental concern. I informed Mr. Matteo that further investigation of his property, adjacent to his scrap yard would be necessary. Mr. Matteo said that he had cleaned up that area several years ago, that people would dump things on his property illegally. I also informed Mr. Matteo that if sampling or a cleanup of his property is necessary he is financially responsible, even if he is not the one who did the dumping, because it is his property.

ATTACHMENT 22

Robert Gorney



antiviral supervisor
am

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

INVESTIGATION

(Initial)

Page 4 of 4

CASE #: 91-01-11-SF01s

DATE: January 15, 1991

RECOMMENDATIONS AND CONCLUSIONS:

The entire Matteo Property, adjacent to the scrap yard was scattered with solid waste. There appears to be areas of potential environmental concern; stressed vegetation, a drum of unknown orangeish/white, solid material spilling onto the soil, and several areas throughout the property where soils have been pigmented.

I recommend further investigation into this site; soil borings, pH testing, and HNU monitoring in some locations. There are several locations that I will request Mr. Matteo to sample for TCLP on my next visit, they are as follow, provided the above mentioned monitoring does not indicate additional areas of concern:

1. the contents of the 55 gallon drum in photograph 5A
2. the black sludgy area in photograph 2A
3. the yellow material around the gopher hole photograph 12B

ATTACHMENT 24

lw

Robert Gomez

INVESTIGATION
(Follow up)

Page 1 of 5

CASE #: 91-01-11-SP01s

FILE #: 08-20-07 PAC #: PTP-U

INVESTIGATOR: Robert T. Gomez

DATE: March 11, 1991

LOCATION: Matteo Property

TIME: in- 1120 out- 1605

ADDRESS: 1708 Rt. 295/130

OWNER: Matteo Scrap Yard

Thorofare, NJ 08086

ADDRESS: Same

COUNTY: Gloucester

BLOCK: 325

LOT: 2

RP: Same

LOCATION TELEPHONE: 609-845-0398

ADDRESS: Same

EPA ID #: NA

LOCAL HEALTH REP: Don Schneider

TELEPHONE: 609-853-3411

COMPLAINANT: Anonymous

TELEPHONE: Anonymous

NATURE OF COMPLAINT: Possible illegal dumping of batteries and paint waste.

PHOTOGRAPHS: Yes (9) from initial investigation of 1-15-91 SAMPLE #: NA
are referenced below.

FINDINGS:

On 3-11-91, Nick Sodano of the SBFO, and myself met with Jim and Frank Matteo, brothers and owners of Matteo Iron and Steel Co. I explained to Jim and Frank that Nick and I were here to do soil borings using a hand auger, that our visit was a follow up to my initial visit on 1-15-91. Frank Matteo was present with Nick and I while we did soil borings along the PSE & G right-of-way (see attached sketch).

Nick and I did a total of twenty soil borings, each was monitored for volatile organics using an HNU. See the attached map for the location of each soil boring. The HNU's (DEF #50362) calibration was checked with Isobutylene prior to use by Nick Sodano (the HNU gave a response of 58ppm on each check). The battery was also checked by Nick and was found to be fully charged.

The location of the twenty soil borings were chosen based on what I was told by the anonymous caller (see initial inspection report 1-15-91). The caller stated that in the area where the gas pipeline went into the marsh is where he encountered buried crushed and partially crushed 55 gallon drums and also what he thought smelled like acid vapors. The soil borings ranged from a depth of 3 ft. to <12 inches, based upon the ability to penetrate through the solid waste which was used as backfill along the pipeline.

The following data was obtained from the soil borings and HNU monitoring of each boring (HNU span setting of 0-20ppm):

1. 2.5 ft. deep - auger rejection, HNU reading of 3ppm
2. 1.5 " " " " " " " 1.5ppm
3. 3.0 " " " " " " " 0.5ppm
4. 1.0 " " " " " " " none registered
5. 2.0 " " " " " " " " " "
- battery check - HNU fully charged
6. 1.0 ft. deep - auger rejection, HNU reading - none registered
7. 8 inches deep - auger rejection, HNU reading - none registered
-HNU recalibrated with isobutylene by Nick Sodano, 100% response
8. 8 inches deep - auger rejection, HNU reading - none registered

RM

Robert Gomez

ATTACHMENT A

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

INVESTIGATION

Page 2 of 5

Case #: 91-01-11-SPQ1s
Date: March 11, 1991

SUMMARY:

9. 10 inches deep - auger rejection, HNU reading - none registered
10. 10 " " " " " " " - initial response of
>20ppm, then nothing, a shovel was then used to go to a depth of
approximately 14 inches, but no reading was registered.

Borings 11 through 20 were between 8 to 12 inches deep due to the high concentration of solid waste in the soil. Each was monitored with the HNU, but no readings were registered.

After the soil borings were completed I took Nick and Frank Matteo to the areas of potential concern that I noted in the initial inspection of 1-15-91. Frank Matteo was then instructed that these areas, identified below would have to be sampled and analyzed by TCLP using a NJ, state certified lab.

The first location of potential environmental concern was a partially crushed 55 gallon drum whose orangeish/white, solid material was spilling onto the ground (photo 5A). The HNU was placed inside this drum, but no reading was registered. Approximately 60 ft. to the west of this drum were 2 crushed 55 gallon drums. Dozing out onto the soil, of the 2 crushed drums was a thick, black material that had an odor like a petroleum product. Which could be detected while standing next to these drums. An HNU reading was taken and a reading of <5ppm (0-20ppm span setting) was registered. Also in this same general area was another crushed 55 gallon drum that contained a brown, soft solid that emanated a sweet volatile odor. A piece of said solid was ground up and placed under a plastic cup, the HNU gave a response varying from 70-100ppm.

In this general area at least 30 55 gallon drums were counted. Most of these drums were all rusted away and appeared to be empty. It should also be noted that this area appeared to be filled, or had soil bulldozed over it. There could be additional drums located under the soil in this area, additional investigation is needed here. There were also crushed plastic lined drums, which usually contain corrosive or reactive materials located in this area.

Approximately 45 ft. to the northwest of the 2 crushed 55 gallon drums was another partially crushed 55 gallon drum. This drum contained a blue and yellow solid material, whose contents were spilling onto the soil. The HNU was placed into this drum, but no reading was registered.

About 100 yds. southwest of the 55 gallon drum containing the blue and yellow solid material was a groundhog hole (photo 12B). The top 6 inches of soil around the groundhog hole was composed of a yellow and white solid material. It could not be determined how far this material extended laterally, it went at least 35 yds. to the southeast where it was spread around a tree (see photo 1A). An HNU reading was taken of this material at the groundhog hole, but no reading was registered.

ATTACHMENT AA2

Robert Gomez

INVESTIGATION

Page 3 of 5

CASE #: 91-01-11-SPD1s

DATE: March 11, 1991

SUMMARY:

A stained area of soil approximately 1 ft. in diameter x 6-8 inches deep was noted about 45 yds. southeast of the above mentioned groundhog hole. The soil looked as if a petroleum product had been dumped there. An HNU reading was taken of this material, but no reading was registered. Another area of stained soil was noted about 20 yds. east of above stained soil, that was approximately the same size. When the soil was overturned it was a pale yellow color and what looked like a painters dust mask was found, stained with same yellow powdery material. An HNU reading was taken and a reading (span setting 0-20ppm) of 15ppm was registered. Jim Matteo joined Frank Matteo, Nick Sodano, and myself at this point.

Nick and I pointed out to Jim Matteo the areas we had pointed out to Frank Matteo as being areas of potential environmental concern. I informed Jim Matteo that these areas would need to be addressed by having a NJ, state certified lab collect samples and analyze the material using the TCLP test.

The following violations were issued on two Field Notices of Violations (FNOV's) for the discharge of petroleum products. The first release being at the 2 crushed 55 gallon drums located between the partially crushed drum that contained the orangeish/white, solid material and the partially crushed 55 gallon drum that contained the blue and yellow solid material. The second discharge was located 45 yds. southeast of the groundhog hole with the yellow and white solids around it. NJSA 58:10-23.11(c) discharge of a hazardous substance and NJSA 58:10-23.11(e) failure to notify the Department of discharge were issued by me. NJAC 7:14A-1.2(c) discharge of a pollutant not in accordance with a valid NJPDES permit was issued by Nick Sodano. Compliance for both FNOV's is scheduled for 4-11-91.

Prior to leaving, Jim and Frank Matteo were told by myself and Nick to have the following sampled and analyzed for TCLP by a NJ, state certified lab, and to isolate the material in the 55 gallon drums:

1. the partially crushed 55 gallon drum of blue and yellow solid material
2. the partially crushed 55 gallon drum of orangeish/white, solid material, photo 5A
3. the 2 crushed 55 gallon drums of what appears to be a waste petroleum product
4. the solid yellow and white material around the groundhog hole, photo 12B.

Jim and Frank Matteo were instructed to forward sample results to me for review before any disposal of the above listed material is undertaken.

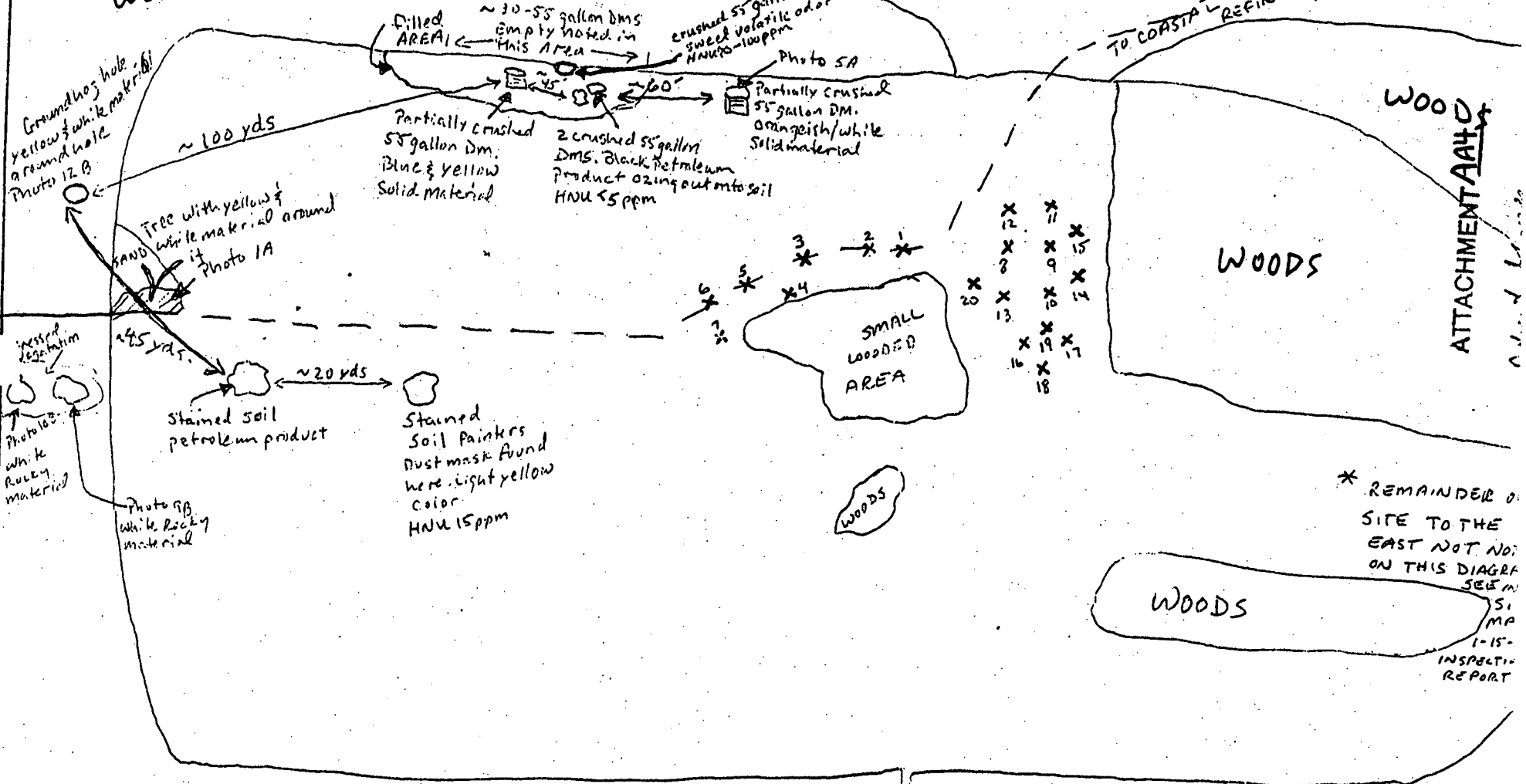
It should be noted that Nick Sodano and myself informed Frank and Jim Matteo that if they failed to have the above listed material analyzed, they could be in violation of NJAC 7:26-8.5(a) which carries a penalty of \$10,000.00. Jim Matteo said not to worry that they intend to comply with the 2 FNOV's issued, and were willing to cooperate.

ATTACHMENT AI

Robert Gomez

WOODS

BATTERY CASINGS Photo 4A



TO COASTAL REFINERY

ATTACHMENT A44

WOODS

WOODS

FUEL TANKS

CROWN POINT TRUCK STOP

WILLOW MOBILE HOMES

MATTED SCRAP YARD

X = Boring location
= Boring

= PSE & gas line marker

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

INVESTIGATION

Page 5 of 5

CASE #: 91-01-11-SP01s

DATE: March 11, 1991

RECOMMENDATIONS AND CONCLUSIONS:

In addition to the sampling outlined above, several areas of potential environmental concern still exist and need to be addressed, they are as follows

1. A contractor will be needed to further investigate the area where the 2 crushed 55 gallon drums of what appears to be a petroleum product is located. This area contained numerous (>30 rusted) empty 55 gallon drums and appeared to have been backfilled or had soil bulldozed over it. Also scattered in this area were several crushed plastic lined drums. These types of drums are usually used to store corrosive or reactive materials.
2. Because the hand auger was unable to penetrate the soil below a foot in the majority of borings performed, test pits will need to be dug. The test pits will be needed to confirm if there are buried, crushed and partially crushed 55 gallon drums onsite; ~~or~~ if there are pockets of what the anonymous caller stated were what he believed to be acidic odors. Because these test pits will be in the area of 2 underground pipelines, PSE & G pipeline (609-573-2003) and Laurel pipeline (609-848-3076) both will need to be notified at least 24 hrs. in advance of any digging.

Based on the presence of volatile organics and that drums are present that are used to contain corrosive or reactive materials, I am recommending that Matteo Iron and Steel Co. hire a contractor to further investigate the above areas of concern. Also the anonymous caller who called in this complaint (see initial report 1-15-91), complained of inhaling what he thought were acidic vapors in the area where the pipeline enters the marsh, and he has complained of having irregular nosebleeds and split lips since he has worked on this site. No further investigative work shall commence until a contractor has been hired and a site health and safety plan has been submitted and reviewed by this office.

ATTACHMENT AAS

Robert H. Jones

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INVESTIGATION

Page 1 of 4

CASE #: 91-01-11-SPO1s

FILE #: 93-20-07 PAC #: PTP-V

INVESTIGATOR: Robert T. Gomez

DATE: May 21, 1991

LOCATION: Matteo Property

TIME: in- 0920 out- 1305

ADDRESS: 1708 Rt. 295/130

OWNER: Matteo Scrap Yard

Thorofare, NJ 08086

ADDRESS: Same

COUNTY: Gloucester

BLOCK: 325

LOT: 2

RP: Same

LOCATION TELEPHONE: 609-845-0398

ADDRESS: Same

EPA ID #: NA

LOCAL HEALTH REP: Don Schneider

TELEPHONE: 609-853-3411

COMPLAINANT: Anonymous

TELEPHONE: Anonymous

NATURE OF COMPLAINT: Possible illegal dumping of batteries and paint waste.

PHOTOGRAPHS: NA

SAMPLE #: YES - WS-1, 2, 3, and 4

FINDINGS:

On the above date and location I met with the following people to witness the sampling of the contents of three drums and one soil sample. Present during sampling were Bill Smith, consultant for Matteo's, Dan Kurtzman, Esp., attorney assisting Tony Olivo, attorney for Matteo's, Tony Olivo, Jeff Gerlach and Christine Blundell, ERM samplers, John Mark and Paul Schiltz, drum overpackers for ERM, Tom Hines of QC Labs, and Frank Matteo. The following information was observed during the sampling.

1. Sample WS - 1: Orange and white solid material.


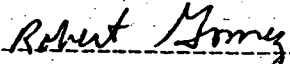
This sample was collected from a 55 gallon drum at 1040 hrs. OVA reading recorded was 10 ppm inside the drum (background 3 ppm). There were no visible markings on the deteriorating drum. The samplers were in level C protection.

2. Sample WS - 2: Black sludgy petroleum product

This sample was collected from a 55 gallon drum at 1100 hrs. No OVA reading was recorded in or around this drum. This drum was flattened out from side to side and there were no visible markings on it. The samplers were in level C protection.

3. Sample WS - 3: Blue, Red, and Yellow solids

This sample was collected from a 55 gallon drum at 1125 hrs. OVA reading recorded was 10 ppm inside the drum. The solids that were exposed to the atmosphere were blue, but the solids under the blue were red and yellow. There were no visible markings on the deteriorating drum. The samplers were in level C protection.

ATTACHMENT 001
SUPERVISOR SIGNATURE
INVESTIGATOR SIGNATURE

INVESTIGATION

Page 2 of 4

Case #:91-01-11-SPC1s
Date: May 21, 1991

SUMMARY:

4. Sample WS - 4: Yellow, powdery, solid material

This sample was collected from a depth of 6 inches below the surface of the ground at the ground hog hole at 1145 hrs. There was no OVA reading registered. A duplicate sample was collected of this material and in addition to being analyzed for TOLP, it will also be analyzed for sulfur. Bill Smith suggested that it be analyzed for sulfur because it looks like sulfur.

Tom Hines said that the samples will be held for at least 2 months. This is in the event further analytical work needs to be done. A verbal confirmation of analytical results should be received in 2 to 3 weeks.

Phase II (test pits), Bill Smith told me he would submit a letter outlining the work that has been done to date, and the work that still needs to be done. Bill Smith and I agreed that within 4 to 6 weeks a draft proposal (scope of work) will be submitted to me for review, then it will be sent out to vendors to bid on. Bill Smith estimated that it will take about 1 week to do the work.

Fifteen test pits will be dug alternating sides along the PGE & G pipeline. The easement is 20 feet wide and test pits will be dug 30 to 40 feet on either side of the easement, where the ground was not disturbed from installing the pipeline. Test Pits will also be dug in the area that is perpendicular to the area where the pipeline enters the water. The test pits will be every 150 to 200 feet apart (see sketch). A menu of sampling parameters will be submitted with a rationale for each; on the day the test pits are dug the parameters will be chosen in the field according to what is found. Samples will then be sent to a state certified lab.

As I was leaving, the drum overpackers from ERM arrived on site. It was agreed that the drums would be overpacked and then stored behind the office, pending the results of the analytical work. I told Bill Smith not to begin overpacking the soils (WS - 4) at the groundhog hole because there was a very large area of contaminated soils there. If the analytical data shows this material is hazardous then it can be excavated.

ATTACHMENT BB2um
SUPERVISOR SIGNATURERobert Gomez
INVESTIGATOR SIGNATURE

INVESTIGATION

Page 3 of 4

CASE #: 91-01-11-8701s

DATE: May 31, 1991

RECOMMENDATIONS AND CONCLUSIONS:

Within 2 to 3 weeks a verbal confirmation of the analytical results will be in. The lab, then disposal of the drums will be initiated. Soil samples then be collected from the areas under and around the drums, if the material was a hazardous waste or substance. No work will begin at the site until the scope of work has been reviewed and approved by the agent. The scope of work will be submitted within 4 to 6 weeks.

It should be noted that Jim and Frank Matted have been very cooperative throughout this investigation.

ATTACHMENT BB3

WMS
INVESTIGATED SIGNATURE

Robert Gomez
INVESTIGATED SIGNATURE

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**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF RESPONSIBLE PARTY SITE REMEDIATION**

FOLLOWUP INVESTIGATION

Page 1 of 2 *OK*

CASE #: 91-8-12-1719-04

FILE #: 08-20-07 PAC: PTP

INVESTIGATOR: Nick Sodano
SITE NAME: Matteo Iron & Steel Company

DATE: 1/14/92
TIME: in-1100 out-1600

1708 U.S. Route 130
Thorofare, NJ 08086
Jim or Frank Matteo
ADDRESS: Crown Point Road
West Deptford

OWNER/RP: same
ADDRESS: same
BLOCK/LOT: 128/2 (perhaps lot 1 also)

COUNTY: Gloucester
LOCATION TELEPHONE: 845-0398

EPA ID #: na
LOCAL HEALTH REP: Chip Woods
COMPLAINANT: Nick Sodano

TELEPHONE: 853-3405
TELEPHONE: 346-8000

NATURE OF COMPLAINT: Hazardous substances discharged into landfill

PHOTOGRAPHS: *none* *by*

SAMPLE #: none

FINDINGS:

On site this date to witness test pits and sampling. On site this morning are Dave Comboy of QC, Scott McQuown of ERM, Bill Smith, Tony Olivo, Paul Schiltz (backhoe operator) of Enviroclean, George Pierson of Buckeye Pipeline, Tony Cappello of PSE&G, and Mr. Bob Millenky (attorney).

Mr. Smith states that if there are no acid vapors, they intend to go after the informant. I stated that was a matter for the attorneys to handle since the man gave his name on a confidential basis. The attorney Bob Millenky stated that a whole host of "common law" decisions gave Matteo the right to view confidential materials if he can show a "need to know".

AREA 1 (known drum dump area)

Test Pit #1 was advanced near the area where flattened drums were discovered on the grounds surface. An exact location for the test pit will correspond to maps of geophysical work which ERM will submit to this office. The yellow material and a white granular material were encountered mostly from 0'-4'. A petroleum odor was encountered at 2'. The PID readings reflected same with an ambient reading of 32 ppm in the hole (photo) and a head space of 780 ppm. "In the hole" reading was obtained by putting the tip of the PID near the sidewall of the excavation. Soils from the 3' to 4' depth gave a PID response of 176 ppm in the hole and 500 ppm headspace. Samples were taken as follows VOAs at 0'-2' and 2'-4' intervals, PP metals and TPH at 2'-4' interval and BNA from soils at 6' depth.

Prior to moving onto the next testpit, I indicated a position where I wanted a testpit in an attempt to find drums which I had observed during my first visit with Bob Gomez. The location was about 10' from the Buckeye pipeline but Mr. Pierson OKed the position. I chose a location which I remembered as a topographic depression, but which was now a mound of loose soil. Next to the mound I observed a young tree with all of its bark and fine branches in place,

WM
SUPERVISOR SIGNATURE

N. Sodano
INVESTIGATOR SIGNATURE

ATTACHMENT FF.1

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF RESPONSIBLE PARTY SITE REMEDIATION

FOLLOWUP INVESTIGATION

CASE #: 91-8-12-1719-04
DATE: 1/14/92

Page 2 of 3 *2/18*

lying on the ground with its roots completely exposed (photos). Mr. Pierson stated that he had observed a large hole in the ground at one time directly over the pipeline which he stated was not caused by Buckeye. Two test pits were dug later in the area I mentioned, but we only encountered a drum lid ring.

Area 2 (pipeline)

Test Pit #2 was done 10' from the PSE&G pipeline. No PID responses were noted. However, sheens were noted on the groundwater (photo) which entered the excavation at a 4'-5' depth. The sheens were mostly of the silver/blue variety but occasional rainbow sheens were observed in the water which swirled into the excavation. Samples were taken in the excavation as per the plan.

Test pit #3 was done in a wooded area about 30' from test pit #2. This area had battery casing strewn on the ground. I walked to the river and found that the entire area was filled with such casings all the way to the river's edge. A PP metals sample was taken in the pit at the 0'-2' level and the 2'-4' level. Just below this level groundwater was encountered. A slight petroleum odor was noted and brilliant rainbow sheens were observed on the water (photos). A sample of the green and blue soils from the saturated zone was obtained for total lead. Samples of the water were taken for TPH and total lead (no filtration).

Attorney Dan Kurtzman arrived at this time. I stated that 15 test pits were not necessarily the final word in this matter. That number could be adjusted upward or downward based on observations and what appears reasonable. Smith and I agreed that a minimum of two more pits in area 1 and two more in area 2 would occur tomorrow. I departed.

CONCLUSIONS AND RECOMMENDATIONS:

1. I believe that the drums which I observed were possibly removed and the area regraded. The area appeared to have been disturbed. Mr. Pierson's comments support this theory. Nevertheless, in light of the size of the area, the close proximity of the pipeline and the failure of geophysical work to precisely locate the drums, I do not feel that further digging is the most effective way to address this site.
2. More sampling and test pits tomorrow.

um

SUPERVISOR SIGNATURE

[Signature]

INVESTIGATOR SIGNATURE

ATTACHMENT RF2

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

INVESTIGATION

Page 1 of 1

CASE #: 91-8-12-1719-04

FILE #: 08-20-07 PAC: PTP

INVESTIGATOR: Nick Sodano
 SITE NAME: Matteo Iron & Steel Company

DATE: 1/3/92
 TIME: in-1000 out-1138

1708 U.S. Route 130
 Thorofare, NJ 08086

ADDRESS: Jim or Frank Matteo
 Crown Point Road
 West Deptford

OWNER/RP: same
 ADDRESS: same
 BLOCK/LOT: 128/2 (perhaps lot 1 also)

COUNTY: Gloucester
 LOCATION TELEPHONE: 845-0398

EPA ID #: na

LOCAL HEALTH REP: Chip Woods

TELEPHONE: 853-3405

COMPLAINANT: Nick Sodano

TELEPHONE: 346-8000

NATURE OF COMPLAINT: Hazardous substances discharged into landfill

SAMPLE #: none

PHOTOGRAPHS: none

Summary: Meeting this date with ERM reps Nick DeSalvo & Scott McQuown, Mr. Bill Smith, Tony Olivo and the Matteo Brothers regarding the results of a geophysical survey done by ERM.

FINDINGS:

Mr. McQuown explained the results of the geophysical survey as follows:

Area 1 (known drum dump area)

Numerous anomalies were noted by inductive or magnetic technology. Some areas produced so much interference as to be uninterpretable. Radar was used in some of the anomaly areas and five locations were found with responses which Mr. McQuown interprets as possibly representative of the "signature" of a drum. Mr. McQuown stated that other anomaly areas showed buried material, but none of which were the size of a drum. All agreed that some "shot in the dark" test pits could be done in anomaly areas which did not show drum signatures with the qualification that full range sampling would not occur for findings of "household trash" in such areas.

Area 2 (pipeline)

No clear drum signatures found. In fact, it was uncertain whether the pipeline was found in two of the transects closest to the river. Mr. McQuown explained that this masking phenomena was typical for clayey soils which attenuate the radar signal. I stated that excavation in that area should proceed as per the plan and a safe distance from the pipeline. Mr. Smith stated coordination with PSE&G and Laural Pipeline people would probably mean that excavation could not start until the week of January 13, 1992. I stated that this was acceptable and Mr. Smith stated that he would call to confirm same. I departed. RECOMMENDATIONS: Await work of start date.

lm
 SUPERVISOR SIGNATURE

ATTACHMENT

FF3 Nick Sodano
 INVESTIGATOR SIGNATURE

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**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF RESPONSIBLE PARTY SITE REMEDIATION**

FOLLOWUP INVESTIGATION

Page 1 of 23

CASE #: 91-8-12-1719-04

FILE #: 08-20-07 PAC: PTP

INVESTIGATOR: Nick Sodano

DATE: 1/15/92

SITE NAME: Matteo Iron & Steel Company

TIME: in-0800 out-1430

1708 U.S. Route 130
Thorofare, NJ 08086
Jim or Frank Matteo

ADDRESS: Crown Point Road
West Deptford

OWNER/RP: same

ADDRESS: same

COUNTY: Gloucester

BLOCK/LOT: 128/2 (perhaps lot 1 also)

LOCATION TELEPHONE: 845-0398

EPA ID #: na

TELEPHONE: 853-3405

LOCAL HEALTH REP: Chip Woods

TELEPHONE: 346-8000

COMPLAINANT: Nick Sodano

NATURE OF COMPLAINT: Hazardous substances discharged into landfill

PHOTOGRAPHS: none

SAMPLE #: none

FINDINGS:

On site this date to witness continued test pits and sampling. On site this morning are Dave Comboy of QC, Scott McQuown of ERM, Bill Smith, Tony Olivo, Paul Schiltz (backhoe operator) of Enviroclean, George Pierson of Buckeye Pipeline, Tony Cappello of PSE&G, and Mr. Dan Kurtzman (attorney).

AREA 1 (known drum dump area)

Test Pit #3 (TP3) was advanced in the area of geophysical anomalies which will be documented in the ERM report to be submitted later to this office. The 0'-2' hoebucket revealed a layer of black material at the bottom of the excavation. The material in the bucket emitted a strong petroleum odor and although the excavation itself did not give such a strong odor to ambient air, it produced a ~30 ppm PID reading in localized areas of the pit. The first bucketload was dumped and the second bucketload revealed a viscous black liquid seeping into the excavation from the sidewalls. The material in the second bucketload contained what appeared to be a ripped, flattened drum (photo) which still had a rounded edge and seam. A bung cap was found in the area and a threaded female fitting was found which appeared to be a former bunghole for a drum. Samples were taken at the 2' & 4" levels (see table below). Water which poured into the excavation was agreed to probably represent a perched zone and further digging was decided against since the aquiclude could be pierced. Sample of the black liquid gave a positive reading on the Clor-n-oil test kit.

A second excavation (TP8) was made ~thirty feet towards the PSE&G pipeline from TP3. This revealed a dry white powder and the ubiquitous yellow material (photo). Since the white material was getting airborne, I stopped the excavation and requested the hoe operator to reorient the hoe upwind and to put on a respirator. Having done so, the hoe operator proceeded and revealed a black layer just below the yellow. The black layer appeared heterogeneous in texture and was leaking contaminated black water confirming the previous suspicions that there was a localized perched zone. Samples were taken (see table below).

SUPERVISOR SIGNATURE

ATTACHMENT 661

INVESTIGATOR SIGNATURE

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF RESPONSIBLE PARTY SITE REMEDIATION

FOLLOWUP INVESTIGATION

Page 2 of 3

CASE #: 91-8-12-1719-04

DATE: 1/14/92

5

Earlier, TP6 and TP7 were advanced in the area where the PSE&G pipeline bends to enter the creek. In both cases, no PID readings were obtained but rainbow sheens were noted on the groundwater which entered the pits. Additionally, the pH of the groundwater was basically neutral. The table below represents soil samples unless the parameter is followed by a "-gw" in which case it represents a groundwater sample.

<u>Test Pit#</u>	<u>Sample Depth</u>	<u>Parameter</u>	<u>Test Pit#</u>	<u>Sample Depth</u>	<u>Parameter</u>
1	2'	VOC; TPH; PPmetal	5	4'	PPmetal-Sludge
1	6'	BNA; TPH	5	4'	Pb; TPH-gw
2	4'	PPmetals; TPH	5	4'	PPmetl; TPH
2	7'	TPH	6	4'	TPH; PPmetals
3	2.5'	TPH; VOC; PCB, BNA	6	4'	BTEX, Pb, TPH-gw
4	2'	TPH; PPmetal	7	4'	PPmetl; TPH; BNA
			8	2'	PPmetl; CN
			8	7'	TPH

CONCLUSIONS AND RECOMMENDATIONS:

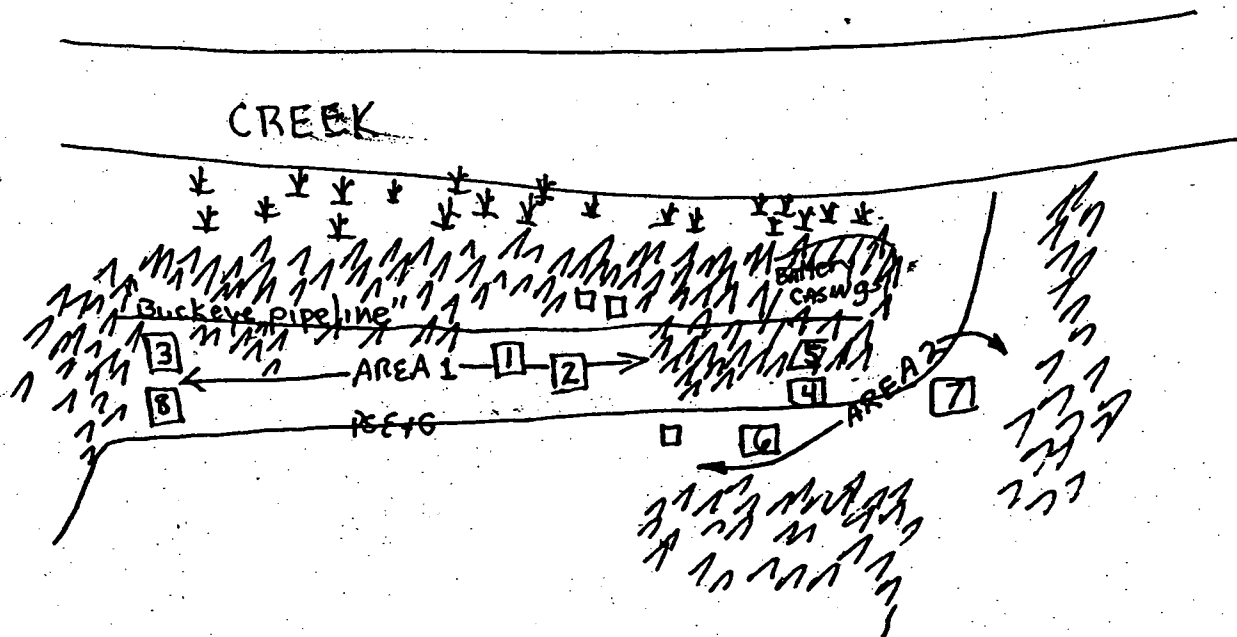
1. Await sampling results.
2. Groundwater appears impacted in the area where the PSE&G pipeline enters the creek.

 SUPERVISOR SIGNATURE

ATTACHMENT 662 Nich Rodaro
 INVESTIGATOR SIGNATURE

Form DWM-051 C
1/86NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT

3 of 3

INVESTIGATIONCASE # 96-8-12-1719-4DATE 1/15/92SKETCHSCALE: NONE
Include directional arrow.lm
Supervisor Signature

COPIES:

White - DWM File

Yellow - Local Health Dept.

Pink - Investigator

N SODANO
Investigator SignatureATTACHMENT 663

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8.20.1



State of New Jersey
Department of Environmental Protection and Energy
 Division of Responsible Party Site Remediation

Southern Field Office
 20 Clementon Road
 Gibbsboro, NJ 08026
 Tel. # 609-346-8000
 Fax. # 609-346-8010

Scott A. Weiner
 Commissioner

Karl J. Delaney
 Director

May 28, 1992

Matteo Iron & Steel Company
 1708 U.S. Route 130
 Thorofare, NJ 08086

Dear Mr. Matteo:

I have reproduced, in part, the February 26, 1992 analytical data in table form along with the applicable [proposed*] regulatory levels. All data is expressed in parts per million.

Location	Depth	Parameter	Result	Limit	Comment
TP-1	4'	TPH	4,540	10,000	No VOCs or Metals
TP-1	6'	TPH	11,880	10,000	Some Semi's, GW proximity unkn.
TP-2	4'	TPH	3,920	10,000	No Metals
TP-2	7'	TPH	233	10,000	
TP-3	3'	TPH	44,600	10,000	No PCB, Few Semi's and VOC
TP-4	4'	Lead	2,700	600	Samples at groundwater
TP-4	4'	Arsenic	120	20	" " "
TP-4	4'	TPH	1,530	10,000	" " "
TP-5	4'	Lead	13,300	600	Samples at groundwater
TP-5	5'	Lead	180	0.01	Ground Water Sample - No TPH
TP-5	4'	TPH	4,160	10,000	Samples at groundwater
TP-6	GW	TPH	80	1	Ground Water Sample
TP-6	GW	Lead	130	0.01	Ground Water Sample
TP-6	4'	Lead	1,100	600	Sample at groundwater
TP-6	4'	TPH	4,590	10,000	Sample at groundwater
TP-7	4'	TPH	4,090	10,000	Sample at groundwater
TP-7	4'	BN	various semivolatile compounds found		
TP-7	4'	Lead	39,200	600	Sample at groundwater

As I discussed with Mr. Olivo yesterday, there are numerous mitigation options for the contamination noted above. A meeting is requested with to discuss the results and resolution of this matter in the context of a Memorandum of Agreement. * The "limits" above are based on proposed regulation which may change prior to promulgation.

Sincerely,

Nick Sodano
 Nick Sodano

HSNS 11

NS

c: William Dunfee, SBFO
 GCND
 Tony Olivo, Esq.
 Christine Neeley, PSE&G

case file 08-20-07

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FALCIANI & FLETCHER

ATTORNEYS AT LAW
A PROFESSIONAL CORPORATION

35 SOUTH BROAD STREET

P.O. BOX 219

WOODBURY, N.J. 08096

(609) 845-8393

FALCIANI
LOUIS D. FLETCHER
REGISTERED CIVIL TRIAL ATTORNEY

TT J. LEWIS

ELO JOHN FALCIANI †

ONETTE L. FALCIANI †

NEW M. SALMON †

EMER NJ AND PA BARS

May 17, 1993

MY FILE NO. FL

MAY 2 1993

Mr. Hendricks
Re: Matteo
May 17, 1993
Page Two

Mr. Wes Hendricks

State of NJ Environmental Protection Energy
Division of Responsible Party Site Remediation
CN-028

Trenton, New Jersey 08625-0028

Dear Mr. Hendricks:

I am writing as a follow up to my phone conversation with you on April 27, 1993 wherein we discussed your proposed Administrative Consent Order which as forwarded to my client, James Matteo and Sons, Inc..

As I indicated to you in our phone conversation, my client is not a corporation of any substantial means. The scrap metal recycling industry works on very close margins and the business basically produces only sufficient net income as salaries for the two principals, James Matteo and Frank Matteo. The Matteo brothers received the corporation from their father and uncle who were the prior principals in the business. The environmental problems that exist on the site date back to the operation of the business by the original incorporators.

At this time, I have reviewed the Administrative Consent Order that you have forwarded and I do not believe that there is any realistic way that my clients could sign this "blank check". I have advised them that they should not sign a document that they have no ability to comply with.

During our phone conversation, we discussed the original sources of the pollution on the site primarily involved a "battery cracking business". Many of the battery casings are still buried or partially buried at the rear of the property and it is possible to determine the names of the manufacturers. In addition,

my client advise me that as much as 70% to 80% of the batteries were brought to the site by one individual. This individual is currently alive and living in Hammonton, New Jersey. However, he has been unwilling to speak with us concerning his prior activities. Jim and Frank Matteo both remember him coming to the business site and believe that he could be very helpful in supplying information concerning where he collected the batteries. The Matteo brothers reasonably believe that a number of large businesses including K-Mart may have been the source of the batteries.

I would be happy to discuss all of the above with you and counsel for the Department sometime over the next two weeks. Please call my office and arrange a mutual convenient meeting time.

Very truly yours,

LOUIS D. FLETCHER

LDF:dms
cc: James Matteo
cc: Frank Matteo
cc: Tony Olivo, Esquire

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State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

JAN 22 1996
M T W T F S S D U M

JAN 23 1996

TO: KENNETH J. KLOO, SECTION CHIEF
SITE ASSESSMENT/ENVIRONMENTAL MEASUREMENTS SECTION

FROM: THOMAS J. COZZI, SECTION CHIEF
BUREAU OF SITE MANAGEMENT *TC*

SUBJECT: SAMPLING AND BACKHOE FOR MATTEO SITE

Site Name: Matteo Brothers
Location: West Deptford Township, Gloucester County
Job Number: H200B700

Attached, please find an Interdivisional Work Request for Sampling and subsequent analyses, along with a Workplan and Health and Safety Plan for the Matteo Site.

Portions of this site were used as a landfill until the 1970s. Two (2) underground pipelines (Buckeye and PSE&G) run through the site; both Buckeye and PSE&G will be contacted by the Bureau of Site Management prior to initiating the sitework.

In addition to this work, we are also requesting that the services of the New Jersey Geological Survey (NJGS) be secured to provide a backhoe with operator to excavate test pits. Approximately five (5) test pits will be dug for retrieval of soil samples; two (2) of these test pits will be in the vicinity of the aforementioned pipelines. Test pits will be located using the Global Positioning satellite system. Soil, sediment, and surface water samples will be obtained by the Bureau of Environmental Measurements and Quality Assurance, with Health and Safety oversight by the Office of Site Safety and Health. The number of samples and the parameters are described in the attached Workplan.

It is estimated that the total field time for this effort is two (2) days and utilize in-house personnel.

Please contact the Site Manager, Carlton Bergman (3-6621), at your earliest convenience to schedule this work and with any questions.

Attachment

cc: D. Pasicznyk, NJGS
M. McCann, BEERA
C. Bergman, BSM
P. Zarillo, BEMQA

ATTACHMENT NNI

SITE INVESTIGATION WORKPLAN

FOR

JAMES MATTEO & SONS, INC. SITE
WEST DEPTFORD TOWNSHIP, GLOUCESTER COUNTY

1. Preliminary Assessment.

1.1 Site background.

The James Matteo & Sons, Inc. site (a.k.a. Matteo Iron & Metal) has been known to the Department since circa 1972. Landfilling of solid and industrial wastes has apparently occurred over an approximately 80 acre site, bounded by a residential trailer park, U.S. Routes 130/295, and wetlands of the Horseshoe Branch of the Hessian Run and Woodbury Creek. These waterways are classified as FW2-NT/SE2; waterways in which there may be a salt water/fresh water interface, as determined by salinity measurements at mean high tide (N.J.A.C.7:9B-1.15(b)6.x).

The site is located in the Inner Coastal Plain geologic sub-province. Site soils are characterized as loamy sands (Soil Survey, Gloucester County, New Jersey, USDA 1962). A site locator map is attached (Figure 1).

1.2 Previous investigation.

Previous investigation of the subject property has included numerous site visits by Department representatives, some of which apparently have resulted in the on-site burial of wastes (circa 1972), issuance of Notice(s) of Violation, drum removal actions, and collection of liquid and solid samples from discarded drums and of soil/solid matrices. Samples of solid/sludges collected during one drum sampling episode identified total recoverable petroleum hydrocarbons ("TPHC") at $\leq 699,190$ ppm.

Documents in the file suggest that materials disposed of onsite have included incinerator ash, from the reclamation of copper from insulated wire, and production wastes from New Jersey Zinc, in addition to what appear to be wastes attributable to Matteo's former battery-metals reclamation business.

1.3 Recent investigation.

1.3.1. PSE&G pipeline construction. An anonymous complaint made to the Department on 11 January 1991, alleged exposure to a hazardous substance ("acidic vapors") during excavation for a natural gas pipeline across the subject site. The complainant reported encountering buried battery casings and partially crushed 55 gallon drums. This complaint resulted in the 14-15 January 1992 excavation of test pits and collection of soil and aqueous samples, by a contractor employed by Matteo and overseen by Department representatives.

ATTACHMENT

NN2

Two areas along the adjacent PSE&G and Buckeye Pipelines (Area 1, the "known drum dump", and Area 2 "pipeline") were investigated via geophysics and test pit excavation. Sheens were observed on ground water entering the test pits. An unidentified "dry, white powder", blue, green, yellow and black substances, and a "viscous black liquid" were encountered during test pit excavation.

Analytical results indicated the presence of TPHC ($\leq 44,600$ ppm), arsenic (≤ 120 ppm), and lead ($\leq 39,200$ ppm) in soils, and TPHC ($\leq 80,000$ ppb) and lead ($\leq 130,000$ ppb) in the ground water within the test pit. Field notes made by the Department representative indicate that ground water in the area where the PSE&G pipeline entered the Hessian Run appeared to be contaminated. A ground water investigation plan was drawn up by the Department, but the investigation was not performed.

1.3.2 Aerial photo review. In April 1994 a review of NJDEP Division of Coastal Resources aerial photographs was completed by BEERA. Evidence of land disturbance/site alteration was apparent throughout the period 1957 to 1979, including what appeared to be filling along the Hessian Run on the site's northern boundary. What appeared to be debris piles, vehicles, and discolored areas were also apparent in the photographs reviewed. The photographs indicate that numerous structures (ie: houses, barns, sheds, etc) have existed on the site in the past, the majority of which appear to have been demolished during the 1970s. What appeared to have been a pond was evident in a 1962 photograph; this feature was not evident in subsequent photographs.

1.3.3 Potable Water. On 31 August 1994, samples were collected from the 2 potable wells located on the site. The samples were analyzed by the New Jersey State Department of Health Laboratory for volatile organic compounds via EPA Method 524.2, pesticides and PCBs via EPA Method 505, semi-volatile organics via EPA Method 625, total petroleum hydrocarbons via EPA Method 418.1, and inorganics via EPA 100 series methods.

Although lead (≤ 57 ug/l), exceeded its N.J. Safe Drinking Water Act Action Level, and sodium ($\leq 51,700$ ug/l), aluminum (≤ 214 ug/l), iron ($\leq 23,560$ ug/l), and manganese (≤ 185 ug/l) exceeded their respective New Jersey Drinking Water Act Secondary Maximum Contaminant Levels, insufficient site data (ie: exact location of previous soil investigation, direction of ground water flow, well depths/screened intervals) exist to attribute contaminants identified in the potable wells to waste disposed on site. Letters notifying the property owner/well users of the results were mailed on 14 March 1995 by the NJDEP Bureau of Safe Drinking Water.

ATTACHMENT N114

1.3.4 Site reconnaissance. On 30 August 1995 the NJDEP DPFSR case team conducted a reconnaissance of the site. Partially buried, broken, vehicle battery casings were evident in several locations along the northern edge of the site. Several empty, rusted drums, building debris, and other solid wastes were also observed.

Access to the site is restricted only from the eastern corner, along U.S. Route 130, where the active Matteo Iron & Metal scrap yard operations are located, although the waterways and associated wetlands to the north, west and south provide a degree of inaccessibility. Evidence (dirt bike, and/or ATV tracks, and human footprints) of site usage by trespassers entering from the adjoining trailer park was apparent, however.

2. Site Investigation Scope of Work.

2.1 Objective. The recent investigations indicate that the surrounding area is supplied with public water. A private potable well located on the adjacent Crown Point Motor Park that reportedly was contaminated with fuel was sealed.

The purpose of this SI is to determine whether potential health threats to casual trespassers may exist on site and to determine whether contaminants may be leaving the site via surface water runoff and/or ground water discharge to the surrounding wetlands of the Hessian Run and Woodbury Creek.

Limited soil, sediment, and surface water investigation will be performed, targeting areas that appear to exhibit the greatest degree of disturbance as evidenced in aerial photo review and site reconnaissance.

2.2 Investigative methods. Due to the disposal practices that have occurred on the site, investigation will consist primarily of test pit excavation, visual characterization of wastes encountered, if any, and sample collection for laboratory analyses as warranted. The frequency of sample collection will be dependent upon the degree of heterogeneity of the wastes encountered or field instrument readings.

Target sample locations have been identified using the Department's Geographic Information System, and information gathered during review of historic aerial photos. New Jersey Plane Coordinate System data were recorded for each target location, and a GIS map site map developed (Figure 2). The project team will locate the target sample points in the field using a Global Positioning System ("GPS") receiver. New Jersey Plane Coordinates for the five (5) proposed locations are listed in Table 1.

TABLE 1

Sample Point	NJ Plane Coordinates	Description
S01	x: 304,170.44 y: 373,358.70	S01 appears to correspond with the area subject to the 1972 complaint of filling-in of wetlands with battery casings
S02	x: 303,144.95 y: 373,493.39	S02 appears to correspond with the location of the 1992 PSE&G pipeline investigation
S03	x: 302,197.29 y: 373,470.48	S03 is situated in an area of apparent ash disposal
S04	x: 302,392.10 y: 372,616.87	S04 is situated in an area of unknown disturbance
S05	x: 303,054.44 y: 373,027.74	S05 is situated in what may have been the filled-in pond

2.2.1 Soil sampling. Each location (except S02) will be sampled at the surface, at 0-6" beneath waste materials encountered, if any, and/or at 0-6" above the water table, or as guided by field instrument readings.

In the case of proposed location S02, which appears to correspond with the area in which test pits were excavated adjacent to the PSE&G pipeline in 1992, additional soil sample collection does not appear warranted at this time. Locating the point via GPS for inclusion into the whole-site SI is proposed. Based upon previous information, surface water and sediment samples will be collected at this location.

2.2.2 Sediment sampling. To determine whether wastes buried along the Hessian Run or Woodbury Creek have migrated into the associated tidal wetlands, sediment samples will be collected at the points where contamination from runoff or ground water may have entered the wetland.

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RECORD OF TELEPHONE DISCUSSION
BEMQA - SITE ASSESSMENT SECTION

MIM1.10040

DATE: 4-29-96

REGARDING: JAMES MATTEO & SONS INC

PERSON INITIATING
PHONE CONTACT:

NICK SODANO

AFFILIATION:

NJDEP

PERSON

CONTACTED:

Colleen Beers

609-845-7114

AFFILIATION:

HEATHER-WILLOW TRAILER PARK

US RT. 130/CROWN PT. ROAD

SUMMARY: I asked Ms. Colleen Beers how many people
reside in the park. Ms. Beers replied that
would be ~ 350 people. How many workers?
~ 3 workers. Are there potable wells at the
park and if so, how many? No wells, the water
comes from the community supply.


SIGNATURE

ATTACHMENT P1

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Weston Solutions, Inc.
Federal Programs Division
Suite 201
1090 King Georges Post Road
Edison, New Jersey 08837-3703
732-225-6116 • Fax 732-225-7037
www.westonsolutions.com

REMOVAL SUPPORT TEAM
EPA CONTRACT 68-W-00-113

April 26, 2005

Mr. Nick Magriples On-Scene Coordinator
U.S. Environmental Protection Agency, Region II
Removal Action Branch
2890 Woodbridge Avenue
Edison, NJ 08837

EPA CONTRACT NO: 68-W-00-113

TDD NO: 02-05-04-0005

DOCUMENT CONTROL NO: RST-02-F-01821

SUBJECT: QUALITY ASSURANCE PROJECT PLAN

Matteo Iron and Metal Site, West Deptford, Gloucester County, New Jersey

Dear Mr. Magriples:

Enclosed please find the multimedia sampling Quality Assurance Project Plan for the Matteo Iron and Metal Site, 1708 Route 130, West Deptford Township, Gloucester County, New Jersey.

If you have any questions, please do not hesitate to call me at (732) 225-6116, extension 230.

Sincerely,

WESTON Solutions, Inc.

A handwritten signature in black ink, appearing to read "Aaron Levy".

Aaron Levy
Site Project Manager

Enclosure

cc: TDD File: 02-05-04-0005

S. Sumbaly, QAO

an employee-owned company

In Association with Scientific and Environmental Associates, Inc.



SITE QUALITY ASSURANCE PROJECT PLAN

**Matteo Iron and Metal Site
1708 Route 130
West Deptford Township, Gloucester County, New Jersey**

**DCN #: RST-02-F-01821
TDD #: 02-05-04-0005
EPA Contract No.: 68-W-00-113**

Prepared by:

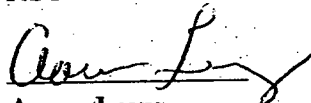
**Removal Support Team
WESTON Solutions Inc.
Federal Programs Division
Edison, New Jersey 08837**

Prepared for:

**U.S. Environmental Protection Agency
Region II - Removal Action Branch
Edison, New Jersey 08837**

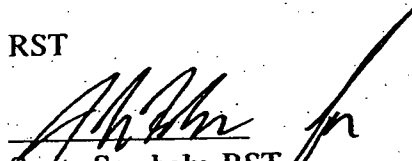
Approved by:

RST


**Aaron Levy
Site Project Manager**

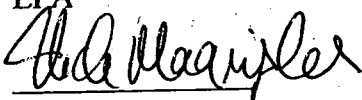
Date: 4/27/05

RST


**Smita Sumbaly, RST
Quality Assurance Officer**

Date: 4/27/05

EPA


**Nick Magriples
On-Scene Coordinator**

Date: 5/10/05

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The following elements are provided in the RST Generic Quality Assurance Project Plan (QAPP) and are included by reference:

QA REPORTS TO MANAGEMENT
 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES
 RECORDS MANAGEMENT SYSTEM
 LOGBOOK PROGRAM
 QUALITY-RELATED DOCUMENTS
 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

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LIST OF ATTACHMENTS

- ATTACHMENT A: Site Location Map
- ATTACHMENT B: EPA/ERT SOP No. 2012 - Soil Sampling
EPA/ERT SOP No. 2009 - Drum Sampling
EPA/ERT SOP No. 2011 - Chip, Wipe, Sweep Sampling
EPA/REAC SOP # 1700 Niton XL722S Field Portable X-Ray Fluorescence
Operating Procedure (Draft)
- ATTACHMENT C: Drum Inventory and Field Testing Log
Drum Location Log
Air Monitoring Work Sheet
- ATTACHMENT D: PCB Field Screening Procedure - SW 846 Method 9078

1.0 INTRODUCTION

Presented herein is the Site Quality Assurance Project Plan (QAPP) for the sampling event to be conducted at the Matteo Iron and Metal Site (Site) by the Region II Removal Support Team (RST). The site QAPP has been developed at the request of the United States Environmental Protection Agency (EPA) in accordance with the RST generic Quality Assurance Project Plan (QAPP).

This plan is based on information currently available and may be modified on-site in light of field screening results and other acquired information. All deviations from the QAPP will be noted in the Sampling Trip Report.

2.0 PROJECT DESCRIPTION

RST is tasked to conduct an Integrated Assessment of the Matteo Iron and Metal Facility, 1708 Route 130, West Deptford Township, New Jersey (see Attachment A - Site Location map). The site is approximately 80 acres in size and consists of a landfill and a recycling facility in the northeast portion. It is situated near the confluence of Hessian Run and Woodbury Creek, approximately one mile east of the Delaware River. In the past, batteries were recycled at the Site using both crushing and burning operations. Wire was also burned for the recovery of metal. Early Responsible Party and DEP investigations identified PCBs and high levels of lead and cadmium in Site soils and lead in a Site potable well. A subsequent EPA investigation estimated the volume of landfilled battery casings on Site to be approximately 235,000 ft³. Lead was also found in the sediments of the Hessian Run and in the marsh areas adjacent to the battery casing disposal area.

EPA Region II has tasked RST and the Site Assessment Team (SAT) to conduct air monitoring, multimedia sampling of drums and soils, and field screening of soils for PCBs and lead at the Matteo Iron and Metal Site. RST will maintain the site logbook to document site activities, prepare a site-specific Health & Safety, QAPP, and Trip Report for EPA TM approval, collect samples, characterize drum samples, provide lab analysis and data validation services, and provide photo-documentation. SAT will create a sampling grid and perform the field screening of soils for lead and PCBs using samples collected from locations on-site and in the trailer park adjacent to the site.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA On-Scene Coordinator (OSC), Nick Magriples, will provide overall direction to the RST staff concerning project sampling needs, objectives, and schedule. The RST Site Project Manager (SPM), Aaron Levy, will be the primary point of contact with the OSC. The SPM is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables. The RST QC Coordinator, Aaron Levy will be responsible for ensuring field adherence to the RST Sampling QA/QC Plan and recording of any

deviations. The RST Quality Assurance Officer (QAO), Smita Sumbaly, will be the primary project team site contact with the subcontracted laboratory, if necessary.

The EPA Work Assignment Manager (WAM), Kristin Dobinson, will provide overall direction to the SAT staff concerning project sampling needs, objectives, and schedule. The SAT Site Project Manager (SPM), Michele Capriglione, will be the primary point of contact with the WAM. The SPM is responsible for the development and completion of the SAT Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables. The SAT Site QC Coordinator, Dan Gaughan will be responsible for ensuring field adherence to the Sampling QA/QC Plan and recording of any deviations.

The following sampling personnel will work on this project:

<u>Personnel</u>	<u>Affiliation</u>	<u>Responsibility</u>
Nick Magriples	Region II, EPA	On-Scene Coordinator
Aaron Levy	Weston-RST	RST Site Project Manager, Sample Management
Michael Mahnkopf	Weston-RST	Drum Sampling, HAZCAT Field Screening, H&S Coordinator
Frank Campbell	Weston-RST	Sampling, Sample Management
John Brennan	Weston-RST	Sampling, Sample Management, QA/QC
Michele Capriglione	Weston-SAT	SAT Site Project Manager, GPS data collection
Heather Carson	Weston-SAT	Field Screening, Niton Portable XRF operator
Jason Standowski	Weston-SAT	Site QC Coordinator, Wetland Delineation
Kathleen Bigelow	Weston-SAT	PCB Field Screening

The following laboratories will provide the following analyses:

<u>Lab Name/Location</u>	<u>Sample Type</u>	<u>Parameters</u>
Ceimic Corporation 10 Dean Knauss Drive Narragansett, RI 02882	Soil	TAL Metals
A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands, TX 77380	Soil	Pest/PCB
TBD	Powdered Solid	Full TCL, TAL Metals, Cyanide, IR

TBD	Drum Waste	TCLP VOC, SVOC, Metals, and Pesticides, Full TCL, TAL Metals, Cyanide, RCRA Characteristics
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A turnaround time of two weeks for written results was requested by the OSC.

4.0 DATA USE OBJECTIVES, QA OBJECTIVES

In addition to the following, the Data Use Objectives, QA Objectives procedure will be conducted in accordance with Sections A7, B2, B4, and B5 of the Region II RST QAPP.

The purpose of the multimedia sampling is to identify the presence or absence of hazardous substances, pollutants or contaminants at the site. This information will be used to supplement existing information in order to determine whether a CERCLA removal action is warranted at the site and to provide data for consideration for placement on the National Priorities List (NPL).

4.1 Data QA Objectives

The overall Quality Assurance (QA) objective for chemical measurement data associated with this sampling event is to provide analytical results that are legally defensible in a court of law. The QA program will incorporate Quality Control (QC) procedures for field sampling, chain of custody, laboratory analyses, and reporting to assure generation of sound analytical results.

The EPA On-Scene Coordinator (OSC) has specified a Level 2 QA objective (QA-2) for soil sample matrices. Soil screening for metals via the XRF has been requested as a QA-2 objective. The drum waste and solid (powdered solid) samples have been specified for a Level 1 QA objective (QA-1), as well as the field screening for PCBs. **Note:** RCRA Characteristics analyses and field characterization of drum waste cannot be performed at QA Level 2.

4.2 QA Objectives

The QA Protocols for a Level 1 QA objective sampling event are applicable to RCRA characteristics and field characterization of drum and soil samples and include:

1. Sample documentation in the form of field logbooks, appropriate field data sheets, and chain of custody records (chain of custody records are optional for field screening locations).
2. Calibration of all monitoring and/or field-portable analytical equipment prior to collection and

analyses of samples with results and/or performance check procedures/methods summarized and documented in a field, personal, and/or instrument log notebook.

3. Field or laboratory determined method detection limits (MDLs) will be recorded along with corresponding analytical sample results, where appropriate.

The QA Protocols for a Level 2 QA objective sampling event are applicable to all sample matrices and include:

1. Sample documentation in the form of field logbooks, appropriate field data sheets, and chain of custody records (chain of custody records are optional for field screening locations).
2. Calibration of all monitoring and/or field-portable analytical equipment prior to collection and analyses of samples with results and/or performance check procedures/methods summarized and documented in a field, personal, and/or instrument log notebook.
3. Field or laboratory determined method detection limits (MDLs) will be recorded along with corresponding analytical sample results, where appropriate.
4. Analytical holding times as determined from the time of sample collection through analysis. These will be documented in the field logbook or by the laboratory in the final data deliverable package.
5. Initial and continuous instrument calibration data.
6. QC blank results (rinsate, trip, method, preparation, instrument, etc.), as applicable.
7. Collection and analysis of blind field duplicate QC sample to provide a quantitative measure of the analytical precision and accuracy, as applicable.
8. Use of the following QC procedure for QC analyses and data validation:

Definitive identification - confirm the identification of analytes on 100% of the "critical" samples, via an EPA-approved method; provide documentation such as gas chromatograms, mass spectra, etc.

Table 1: QUALITY ASSURANCE OBJECTIVES

QA Parameters	Matrix	Intended Use of Data	QA Objective
Full TCLP (minus Herbicides), Full TCL, - TAL Metals, Cyanide	Waste	Characterization of material	QA-1
RCRA Characteristics	Waste	Characterization of material	QA-1
XRF Field Screening (Lead)	Soil	Delineate potential lead contamination	QA-2
PCB Field Screening	Soil	Delineate potential PCB contamination	QA-1
PCBs, TAL Metals	Soil	Verify presence or absence of hazardous substances	QA-2
Field Characterization (HAZCAT)	Waste	Field Screening for hazard categorization, selection of laboratory samples and IATA/DOT shipping requirements	QA-1
Full TCL, TAL Metals, CN, IR analysis	Powdered Solid	Characterization of material	QA-1

A Field Sampling Summary is attached in Table 2 and a QA/QC Analysis and Objectives Summary is attached in Table 3. Section 5.1, Sampling Design, provides information on analyses to be performed on the samples collected.

**TABLE 2:
FIELD SAMPLING SUMMARY**

Analytical Parameters	Matrix	Container Size	Preservative	Holding Time¹	Subtotal Samples	Trip Blanks	Rinsate Blanks²	Duplicate Samples	MS/MSD Samples	Total Field Samples
Full TCLP (minus Herbicides)	Waste	8-oz glass jar, per fraction	ice to 4°C	VOA 14 days to analysis, SemiVOA, Pest/PCB- 7 days for extraction 14 days for analysis	10 ⁴	NR	NR	NR	NR	10 ⁴
RCRA Characteristics	Waste	8-oz glass jar	ice to 4°C	Flash Point - 30 days pH - ASAP NA - all other parameters	10 ⁴	NR	NR	NR	NR	10 ⁴
Lead and Manganese (Field Screening)	Soil	1-gallon Plastic Bag	ice to 4°C	180 days	75	NR	NR	8	NR	83
PCB (Field Screening)	Soil	1-gallon Plastic Bag	ice to 4°C	7 days	75	NR	NR	8	NR	83
PCB	Waste	8-oz glass jar	ice to 4°C	7 days for extraction, 14 days for analysis	10 ⁴	NR	NR	1	1	12 ⁴
PCB	Soil	8-oz glass jar	ice to 4°C	7 days for extraction, 14 days for analysis	23	NR	NR	2	2	27
Cyanide	Waste	8-oz glass jar	ice to 4°C	14 days analysis	10 ⁴	NR	NR	NR	NR	10 ⁴

Analytical Parameters	Matrix	Container Size	Preservative	Holding Time ¹	Subtotal Samples	Trip Blanks ³	Rinsate Blanks ²	Duplicate Samples	MS/MSD Samples	Total Field Samples
TAL Metals	Soil	8-oz glass jar	ice to 4°C	6 months analysis, 28 days mercury analysis	23	NR	NR	2	2	27
Full TCL	Waste	8-oz glass jar	ice to 4°C	VOA 14 days to analysis. SemiVOA, Pest/PCB- 7 days for extraction 14 days for analysis	10 ⁴	NR	NR	NR	NR	10 ⁴
TAL Metals	Waste	8-oz glass jar, per fraction	ice to 4°C	6 months analysis, 28 days mercury analysis	10 ⁴	NR	NR	NR	NR	10 ⁴
TAL Metals, Full TCL, Cyanide, IR analysis	White Powder	8-oz glass jar per fraction	ice to 4°C	Metals - 6 months analysis, 28 days mercury analysis, VOA- 14 days to analysis, SemiVOA, Pest/PCB- 7 days for extraction 14 days for analysis	1	NR	NR	NR	NR	1
Field Screening (HAZCAT)	Waste	8-oz glass jar	ice to 4°C	14 days analysis	10 ⁴	NR	NR	NR	NR	10 ⁴

¹ Holding time from date of sampling.

² Only required if non-dedicated sampling equipment to be used. NR - not required, dedicated sampling equipment to be used.

³ Not required

⁴ Exact number will be based on initial findings and field screening results

TABLE 3
QA/QC ANALYSIS AND OBJECTIVES SUMMARY

Analytical Parameters	Matrix	Analytical Method Reference	QA/QC Quantitation Limits	QA Objective
Full TCLP (minus Herbicides)	Waste	SW 846 Method 1311- extraction; 8270C- BNA; 8260B - VOA ; 8081 - Pesticide; 6010B / 7000 - Metals	As per method	QA-1
Full TCL	Waste	<u>TCL VOA</u> -EPA Method 8260B <u>TCL PCBs</u> - EPA Method 8082 <u>TCL PEST</u> - EPA Method 8081 <u>TCL SVOA</u> - SemiVolatiles-SW846 Method 8270C or CLP OLMO4.2	As per method	QA-1
TAL Metals	Waste	SW846 Method 6010B/7000 or ILMO5.2	As per method	QA-1
RCRA Characteristics	Waste	SW846 Method 1010- Ignitability, Method 9040- corrosivity, Method 9010/9030- Reactivity	As per method	QA-1
Cyanide	Waste	EPA Method 9013/9012A	As per method	QA-1
TAL Metals	Soil	SW 846 Method 6010B/7000 or ILMO 5.2	As per method	QA-2
Field Screening (Lead)	Soil	SOP # 1700 Niton XL722S Field Portable X-Ray Fluorescence Operating Procedure	As per method	QA-2
Field Screening (PCBs)	Soil	SW 846 Method 9078	As per method	QA-1

Analytical Parameters	Matrix	Analytical Method Reference	QA/QC Quantitation Limits	QA Objective
TCL PCBs	Soil	SW 846 Method 8082 or OLMO 4.2	As per method	QA-2
Full TCL	Powder Solid	<u>TCL VOA</u> -EPA Method 8260B <u>TCL PCBs</u> - EPA Method 8082 <u>TCL PEST</u> - EPA Method 8081 <u>TCL SVOA</u> - SemiVolatiles-SW846 Method 8270C or CLP OLMO4.2	As per method	QA-1
TAL Metals	Powder Solid	SW846 Method 6010B/7000 or ILMO5.2	As per method	QA-1
Cyanide	Powder Solid	EPA Method 9013/9012A	As per method	QA-1
IR analysis	Powder Solid	TBD	As per method	QA-1

5.0 APPROACH AND SAMPLING PROCEDURES

In addition to the following, the Approach and Sampling Procedures will be conducted in accordance with Sections B1 and B4 of the Region II RST QAPP.

The following sampling activities will be conducted at the Matteo Iron and Metal Site:

- Soil Sampling
- Drum Sampling
- Drum and container inventory (survey)
- Field characterization of drum waste
- Field screening of soils for lead using XRF.
- Field screening of soils of PCBs using immunoassay tests.

This sampling design is based on information currently available and may be modified on-site in light of field screening results and other acquired information. All sampling activities will be performed by the Region II RST, under the direction of the EPA On-Scene Coordinator (OSC). Any deviations from the sampling plan will be noted in the Sampling Trip Report.

5.1 Sampling Design

During this sampling event, RST will visit the site to inventory all drums on-site and place them onto the drum log sheet (Appendix C). The drum area will be monitored for LEL, Organic Vapors, and radiation. RST will then open and survey each drum. Depending upon the results of this survey, a select number of drums will have samples collected for field screening characterization (HAZCAT) using drum thieves or other devices. Based upon the results of the screening, the drums samples may be composited. The composite samples will then be sent to the laboratory for further analysis.

During this event, four soil samples will be collected from the outside paved area and the street curb area. Soils on top of paved areas will be collected for TAL metals and Polychlorinated Biphenyls (PCBs). Composite soil samples will be collected using plastic disposable scoops, composited in disposable aluminum pans, and placed into the sample jars. If necessary, sweep samples will be taken where the soil layer is not thick enough to use a disposable scoop. In addition, soil samples will be collected from a sampling grid, as described below, on the Site and on the neighboring property, to the west of the Site

from 0-6" for Lead and Polychlorinated Biphenyls (PCBs) field screening. These will be collected using plastic disposable scoops.

As a part of this investigation the Region 2 Site Assessment Team (SAT) was tasked with confirming or denying the presence of PCBs and lead on the Matteo property and at the adjacent property, the Willow Woods Trailer Park. A minimum of 54 samples will be collected on the Matteo property in areas of previously identified PCB contamination, along the boundary of the Matteo property and the adjacent trailer park, and in the trailer park. SAT will screen each sample for the presence of PCBs and lead using PCB immuno-assay kits and an X-Ray Fluorescence machine for PCB and lead detection, respectively. When all of the on site samples are collected and screened, including the boundary samples considered to be on site, 20% of the screened locations will be sampled and sent for Contract Laboratory Program (CLP) analysis for PCBs and TAL Metals. Additionally when all of the trailer park samples are collected and screened including the boundary samples considered to be in the trailer park, 20% of the screened locations will be sampled and sent for CLP analysis for PCBs and TAL Metals.

The on site sample locations were determined by placing a 200-foot grid over areas on the Matteo property where surficial PCB contamination was previously revealed in the Final Remedial Investigation Report (RI) completed in May 2004. There are several locations previously sampled during the 2004 RI from which samples will be collected during this event (Attachment A).

A 100-foot grid will also be placed along the boundary of the trailer park and the Matteo property in order to determine if contamination observed at the Matteo property is affecting the trailer park. A 200-foot grid will be placed over the Willow Woods Trailer Park to confirm or deny the presence of PCBs and lead in the trailer park. Samples collected for screening purposes in the trailer park will be collected from the lawns of the trailer homes.

XRF Field Screening

Field Screening will be completed following SOP 1700 (See Attachment B).

PCB Screening

See Attachment D for PCB field screening procedures (SW 846 Method 9078).

5.2 Schedule of Activities

Proposed Start Date	Activity	End Date
April 27, 2005	Drum Inventory, Air Monitoring, Field Screening, Drum Sampling, Soil Sampling, XRF and PCB Field Screening	April 29, 2005

5.3 Sampling Equipment

Soil samples will be collected with dedicated, disposable plastic scoops and aluminum pans in order to avoid cross-contamination. Drum samples will be collected with drum thieves, coliwasas, or scoops.

5.4 Sample Identification System

Each sample collected by Region II RST will be designated by a code which will identify the site. The code will be a site-specific project tracking number. The code for the Matteo Iron and Metal Site is **MIM**. The media type will follow the numeric code and refer to all matrices or sources. A hyphen will separate the site code and media type. Specific media types are as follows:

- **MIM-SO-** soil
- **MIM-DR-** drum
- **MIM-O-** oil
- **MIM-PS-** powder solid

After the media type, the sequential sample numbers will be listed; sample numbers will be identified as to their location on the site location and/or the location on the \bar{x} and \bar{y} coordinates of a sampling grid if applicable. A duplicate sample will be identified in the same manner as other samples and will be distinguished and documented in the field logbook.

5.5 Standard Operating Procedures (SOPs)

5.5.1 Sample Documentation

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by

lining through the incorrect entry and by initialing the error.

FIELD LOGBOOK

The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number
2. Name(s) of personnel on site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations
8. Sample and sample location identification and description*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with chain of custody.
11. Record of photographs
12. Site sketches

* - The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date.

SAMPLE LABELS

Sample labels will clearly identify the particular sample, and should include the following:

1. Site/project number.
2. Sample identification number.
3. Sample collection date and time.
4. Designation of sample (grab or composite).
5. Sample preservation.

6. Analytical parameters.
7. Name of sampler.

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

CUSTODY SEALS

Custody seals demonstrate that a sample container has not been tampered with, or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

5.5.2 Sampling SOPs

The following Sampling SOPs will be used for this project:

- EPA/ERT SOP # 2012 - Soil Sampling
- EPA/ERT SOP # 2009 - Drum Sampling
- EPA/ERT SOP # 2011 - Chip, Wipe and Sweep Sampling
- EPA/REAC SOP # 1700- Niton XL722S Field Portable X-Ray Fluorescence Operating Procedure (Draft)

5.5.3 Sample Handling and Shipment

Caps will be secured with custody seals. Bottle labels will contain all required information including the site/project code, sample number, time and date of collection, analyses requested and preservative used. Sealed bottles will be placed in a zip lock plastic bag. The zip lock bag will be placed in large metal or plastic shipping containers. Soil samples will be cooled to 4°C and delivered to the analytical laboratory. All packaging will conform to IATA Transportation regulations for overnight carriers, if applicable.

All sample documents will be sealed in a plastic bag and affixed to the underside of each cooler lid. The lid will be sealed and affixed on at least two sides with custody seals so that any sign of tampering is easily visible.

5.6 Sample Containers

All sample containers will meet the QA/QC specifications in OSWER Directive 9240.0-05A, "Specifications and Guidance for Contaminant Free Sample Containers".

5.7 Disposal of PPE and Contaminated Sampling Materials

All PPE used by RST will be decontaminated on-site and disposed of in appropriate trash receptacle during this site investigation. Investigation derived waste (IDW) from the drum sampling event will be returned to the appropriate drum. SAT personnel will be responsible for the disposal of the IDW generated from the PCB test kits.

6.0 SAMPLE CUSTODY

In addition to the following, the Sample Custody procedure will be conducted in accordance with Section B3 of the Region II RST QAPP.

A chain of custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook.

The chain of custody record should include (at minimum) the following:

1. Sample identification number
2. Sample information
3. Sample location
4. Sample date
5. Name(s) and signature(s) of sampler(s)
6. Signature(s) of any individual(s) with custody of samples

A separate chain of custody form must accompany each cooler for each daily shipment. The chain of custody form must address all samples in that cooler, but not address samples in any other cooler. This practice maintains the chain of custody for all samples in case of mis-shipment.

7.0

FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE

In addition to the following, the Field Instrument and Preventative Maintenance procedure will be conducted in accordance with Section B6 of the Region II RST QAPP.

The sampling team is responsible for assuring that a calibration/maintenance log will be brought into the field and maintained for each measuring device. Each log will include at a minimum, where applicable:

- name of device and/or instrument calibrated
- device/instrument serial and/or ID number
- frequency of calibration
- date of calibration
- results of calibration
- name of person performing the calibration
- identification of the calibrant

Equipment to be used each day will be calibrated prior to the commencement of daily activities.

8.0

ANALYTICAL METHODS

The purpose of the following tests is to classify various unknown containerized waste materials into compatible groups based on their physical and chemical characteristics.

All field compatibility tests will be completed in accordance with the HAZCAT® field identification manual.

1. Air Reactivity - Each sample will be opened and checked for any reaction.
2. Water Reactivity - Each sample will be checked for reactivity by adding nine (9) parts deionized water to one (1) part sample.
3. Water Solubility - Each sample will be checked for water solubility by placing one (1) mL portion of the sample into a small test tube containing nine (9) mL of deionized water. The sample is thoroughly mixed and the following observations will be made:
 1. Sample soluble in water; indicates an inorganic compound or a polar organic

compound;

2. Sample partially soluble in water or forms emulsion in water;
3. Sample insoluble in water and less dense than water;
4. Sample insoluble in water and more dense than water;
5. Sample glimmering in water.

4. Hexane Solubility - Each sample will be checked for hexane solubility by placing one (1) portion of the sample into a small test tube containing nine (9) portions of hexane. The sample is thoroughly mixed and the following observations will be made:

1. Sample soluble in hexane; indicates a possible organic compound;
2. Sample partially soluble in hexane;
3. Sample insoluble in hexane.

5. pH Test - The pH will be measured on aqueous samples and water soluble solid phase samples. The pH will be determined with pHdrion paper. The following observations will be made:

1. Sample with $\text{pH} < \text{or} = 2$; indicates a compound meeting the characteristic of corrosivity;
2. Sample with $\text{pH} > 2, < 12.5$; indicates non-corrosive compound;
3. Sample with $\text{pH} > \text{or} = 12.5$; indicates a compound meeting the characteristic of corrosivity;

If a color change appears that does not match the pH chart, the sample will be diluted with additional water and retested. The dilution will be noted on the drum inventory log.

6. Oxidizer Test - The oxidizer test will be performed on all samples. Potassium iodine-starch test paper will be acidified with one normal hydrochloric acid. The test strip will be touched to the sample. If it turns black or brown, the test is positive.

7. Peroxide Test - The peroxide test will be performed on aqueous and organic phase liquids and hexane and water soluble solid phase samples. Emquant-r peroxide test strips will be used to determine the presence of peroxides. If the test strip changes color, beige to gray or blue, the test is usually positive.

8. Cyanide Test - The cyanide test will be performed on aqueous phase and water soluble

solid phase samples. The sample will be acidified and the vapors will be checked with cyanosmo test paper.

9. Sulfides Test - The sulfides test will be performed on aqueous phase and water soluble solid phase samples. Lead acetate test paper will be moistened with deionized water. The paper is placed over a portion of the sample which will be acidified with 1N hydrochloric acid. If the paper turns black, the test is positive.
10. Chlorinated Solvents Screen - Each organic sample will be checked for the presence of chlorinated organic compounds. A portion of the sample will be placed on clean, 18 gauge copper wire. The sample and the wire will be held in a flame. If it turns the flame green, the test usually indicates the presence of chlorine.
11. Flammability/Ignitability Test - This test will be performed by pouring enough liquid or solid sample into a small dish to cover the bottom of it. A lighted match will be slowly passed under the dish in order to heat the sample. After the sample is sufficiently heated, the match will be placed in the sample. The following observations will be made:
 1. The sample ignites; If the flame is nearly invisible, the sample may be an alcohol. If the flame is bright yellow and emits black smoke, the sample is a pure hydrocarbon compound.
 2. The sample ignites, but sizzles; indicated the sample is an organic compound, but contains water;
 3. The sample does not ignite; indicates sample is an inorganic compound or an organic compound with a high flash point.

Analytical methods to be utilized in the analyses of samples collected during this sampling event are detailed in Table 3.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

In addition to the following, the Data Reduction, Validation, and Reporting procedure will be conducted in accordance with Sections D1, D2, and D3 of the Region II RST QAPP.

9.1 Deliverables

The RST SPM, Aaron Levy, will maintain contact with the EPA OSC, Nick Magriples, to keep him informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will

be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

TRIP REPORT

A trip report will be prepared to provide a detailed accounting of what occurred during each sampling mobilization. The trip report will be prepared within two weeks of the last day of each sampling mobilization. Information will be provided on time of major events, dates, and personnel on site (including affiliations).

MAPS/FIGURES

Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

ANALYTICAL REPORT

An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain of custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

DATA REVIEW

A review of the data generated under this plan will be undertaken. The assessment of data acceptability or usability will be provided separately, or as part of the analytical report.

In order to establish the level of consistency achieved by the XRF unit, a correlation between confirmation sample results and XRF field screening results will be made. A regression analysis of the two data sets will be performed. In order to meet EPA QA/QC Level 2 data requirements, the regression analysis must yield correlation coefficient (r^2) of greater than 0.7. The r^2 value resulting from the regression analysis indicates how close the relationship between the two analytical methods is to being linear. A perfect linear relationship would yield an r^2 value of 1. Although the regression is not an indicator of accuracy directly, it is an indicator of how accurately you could predict laboratory results from the relationship established between the laboratory data and the XRF field screening results. As an indicator of overall accuracy, RST will calculate the average relative percent difference between the two data sets.

9.2 Data Validation

Data generated under this QA/QC Sampling Plan will be evaluated according to criteria contained in the Removal Program Data Validation Procedures that accompany OSWER Directive number 9360.4-1 and in accordance with Region II guidelines.

10.0 FIELD QUALITY CONTROL CHECKS AND FREQUENCY

In addition to the following, the Field Quality Control Checks and Frequency procedure will be conducted in accordance with Section B7 of the Region II RST QAPP. This section details the Quality Assurance/Quality Control (QA/QC) requirements for field activities performed during the sampling effort.

The following QA Protocols for XRF data are applicable to all XRF samples and include:

1. Daily instrument checks (Energy Calibration Check, Resolution Check and Zero Check).
2. Initial and continuing analysis of standards. The XRF result for medium and high standards shall be within 20% of the certified concentration of each contaminant of concern. Low, medium and high standards will be analyzed at the beginning of each screening day, at the termination of sample screening every day and following every tenth field sample analyzed.
3. Duplicate XRF analysis to be performed on at least 10% of all samples to determine the precision of sample preparation. The precision is expressed in terms of the Relative Percent Difference (RPD). A duplicate sample is a second XRF cup from the sample point.
4. Replicate XRF analysis to be performed on at least 10% of all samples to determine analytical precision. The precision is expressed in terms of the RPD for two replicate analyses, or the Relative Standard Deviation (RSD) for three replicate analyses. A replicate is a re-analysis of a single XRF cup.
5. For this sampling event, the OSC has requested that approximately 20% of the samples screened in the field using XRF be analyzed by an outside laboratory via Inductively Coupled Plasma (ICP) analysis.

Precision

Precision during XRF analysis is monitored by analyzing the NIST SRM standards at the start and the end of sample analysis and after approximately every tenth sample. Determining the precision around the site action level can be extremely important if the XRF results are to be used in an enforcement action.

For XRF results, ideally, the sample cup (if used) that was analyzed by XRF should be the same sample that is sent for confirmatory analysis. However, since the samples are being submitted for TAL Metals analysis, this will not be sufficient volume. An 8oz. jar of soil from the original homogenized aliquot

will be submitted for TAL Metals analysis. When confirming an in-situ analysis, collect a sample from 12 inch by 12 inch area for both an XRF measurement and confirmation analysis.

QC Procedures for use of EnSys PCB Soil Test System

The EnSys PCB Soil Test Kit uses a rapid immunoassay screening method to identify PCBs in soil. A four phase method is used, and includes: extraction and preparation of the sample, sample and standard preparation, immunoassay, and analysis of results.

As part of the QA the Kit analyzes 10 soil samples per batch, plus two standards. Standards are run in duplicate with each kit, and therefore with every 10 samples that are analyzed. The standards that are run with each kit are compared using a photometer to ensure that they are within the QC limit < -0.3 .

11.0 SYSTEM AUDIT

In addition to the following, the System Audit procedure will be conducted in accordance with Section C1 of the Region II RST QAPP.

The Field QA/QC Officer will observe sampling operations and review subsequent analytical results to ensure compliance with the QA/QC requirements of the project/sampling event.

12.0 CORRECTIVE ACTION

In addition to the following, the Corrective Action procedure will be conducted in accordance with Section C1 of the Region II RST QAPP.

All provisions will be taken in the field and laboratory to ensure that any problems that may develop will be dealt with as quickly as possible to ensure the continuity of the project/sampling events. Any deviations from this sampling plan will be noted in the final report.

ATTACHMENT A

SITE LOCATION MAP

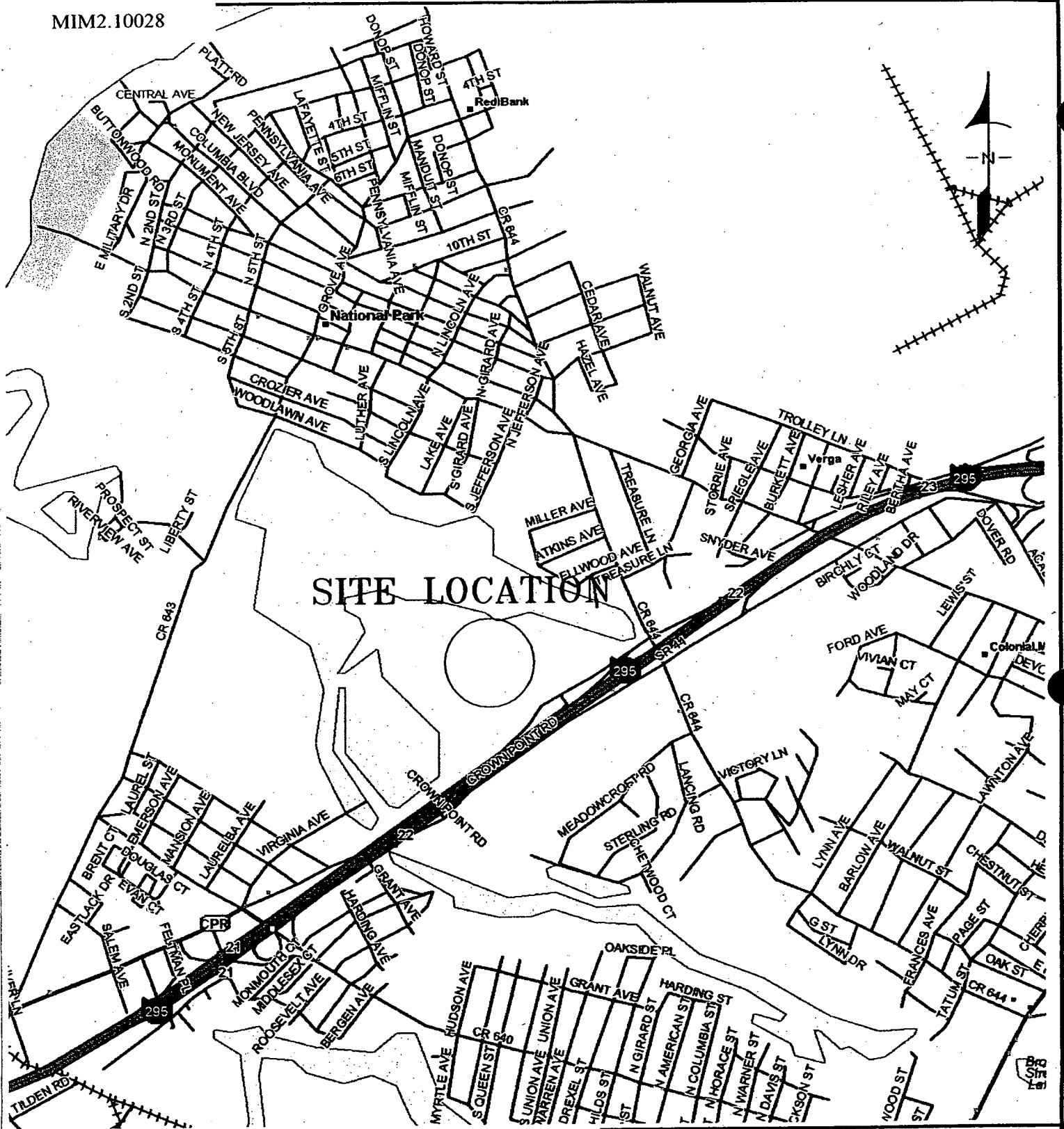


FIGURE 1
SITE LOCATION MAP
MATTEO IRON AND METAL SITE
WEST DEPTFORD, NJ

US ENVIRONMENTAL PROTECTION AGENCY

REMOVAL SUPPORT TEAM
 CONTRACT # 68-W-00-113

EDITED BY: V. HENSCHER

EPA OSC: N. MAGRIPLES

SITE PROJECT MANAGER: A. LEVY

FILE: D:\DWG\MATTEO



Weston Solutions Inc.
FEDERAL PROGRAMS DIVISION

IN ASSOCIATION WITH SCIENTIFIC ENVIRONMENTAL ASSOCIATES, INC.
 TERRANEARPMC,
 AND INNOVATIVE TECHNOLOGICAL SOLUTIONS INC.

ATTACHMENT B

EPA/ERT SAMPLING SOPS

SOP # 2012 - Soil Sampling

SOP # 2009 - Drum Sampling

SOP # 2011 - Chip, Wipe & Sweep Sampling

**EPA/REAC SOP# 1700- Niton XL722S Field Portable X-Ray Fluorescence Operating Procedure
(Draft)**



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- 4.0 POTENTIAL PROBLEMS
- 5.0 EQUIPMENT
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 - 7.2.1 Surface Soil Samples
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 - 7.2.3 Sampling at Depth with a Trier
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1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the procedures for the collection of representative soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push, or other mechanized equipment (except for a back-hoe). Analysis of soil samples may determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of pollutants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, continuous flight auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Samples should, however, be cooled and protected from sunlight to minimize any potential reaction. The amount of sample to be collected and proper sample container type are discussed in ERT/REAC SOP #2003 Rev. 0.0 08/11/94, *Sample Storage, Preservation and Handling*.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary potential problems associated with soil sampling - cross contamination of samples and improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

5.0 EQUIPMENT



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Soil sampling equipment includes the following:

- Maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan
- Survey equipment or global positioning system (GPS) to locate sampling points
- Tape measure
- Survey stakes or flags
- Camera and film
- Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Canvas or plastic sheet
- Spade or shovel
- Spatula
- Scoop
- Plastic or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoons
- Vehimeyer soil sampler outfit
 - Tubes
 - Points
 - Drive head
 - Drop hammer
 - Puller jack and grip
- Backhoe



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Reagents are not used for the preservation of soil samples. Decontamination solutions are specified in ERT/REAC SOP #2006 Rev. 0.0 08/11/94, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order.
4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator (OSC) prior to soil sampling; and utility clearance should always be confirmed before beginning work.

7.2 Sample Collection

7.2.1 Surface Soil Samples

Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials should not be used. Plating is particularly common with garden implements such as potting trowels.

The following procedure is used to collect surface soil samples:



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1. Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.
2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area which came in contact with the spade.
3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Several types of augers are available; these include: bucket type, continuous flight (screw), and post-hole augers. Bucket type augers are better for direct sample recovery because they provide a large volume of sample in a short time. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

The following procedure is used for collecting soil samples with the auger:

1. Attach the auger bit to a drill rod extension, and attach the "T" handle to the drill rod.



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2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first three to six inches of surface soil for an area approximately six inches in radius around the drilling location.
3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.
4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole and proceed to Step 10.
5. Remove auger tip from the extension rods and replace with a pre-cleaned thin wall tube sampler. Install the proper cutting tip.
6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.
7. Remove the tube sampler, and unscrew the drill rods.
8. Remove the cutting tip and the core from the device.
9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.
10. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly.

When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.



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11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.
12. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

7.2.3 Sampling with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.
2. Rotate the trier once or twice to cut a core of material.
3. Slowly withdraw the trier, making sure that the slot is facing upward.
4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should



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be performed in accordance with ASTM D1586-98, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.
2. Place the sampler in a perpendicular position on the sample material.
3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.
4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.
5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.
6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is probably the most expensive sampling method because of the relatively high cost of backhoe operation.

The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.
2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.



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3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.
4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.
5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.
6. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.
7. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration



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activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan..

12.0 REFERENCES

Mason, B.J. 1983. Preparation of Soil Sampling Protocol: Technique and Strategies. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1984. Soil Sampling Quality Assurance User's Guide. EPA-600/4-84-043.

U.S. Environmental Protection Agency. 1984 Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, E.R., B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018.

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APPENDIX A
Figures
SOP #2012
February 2000



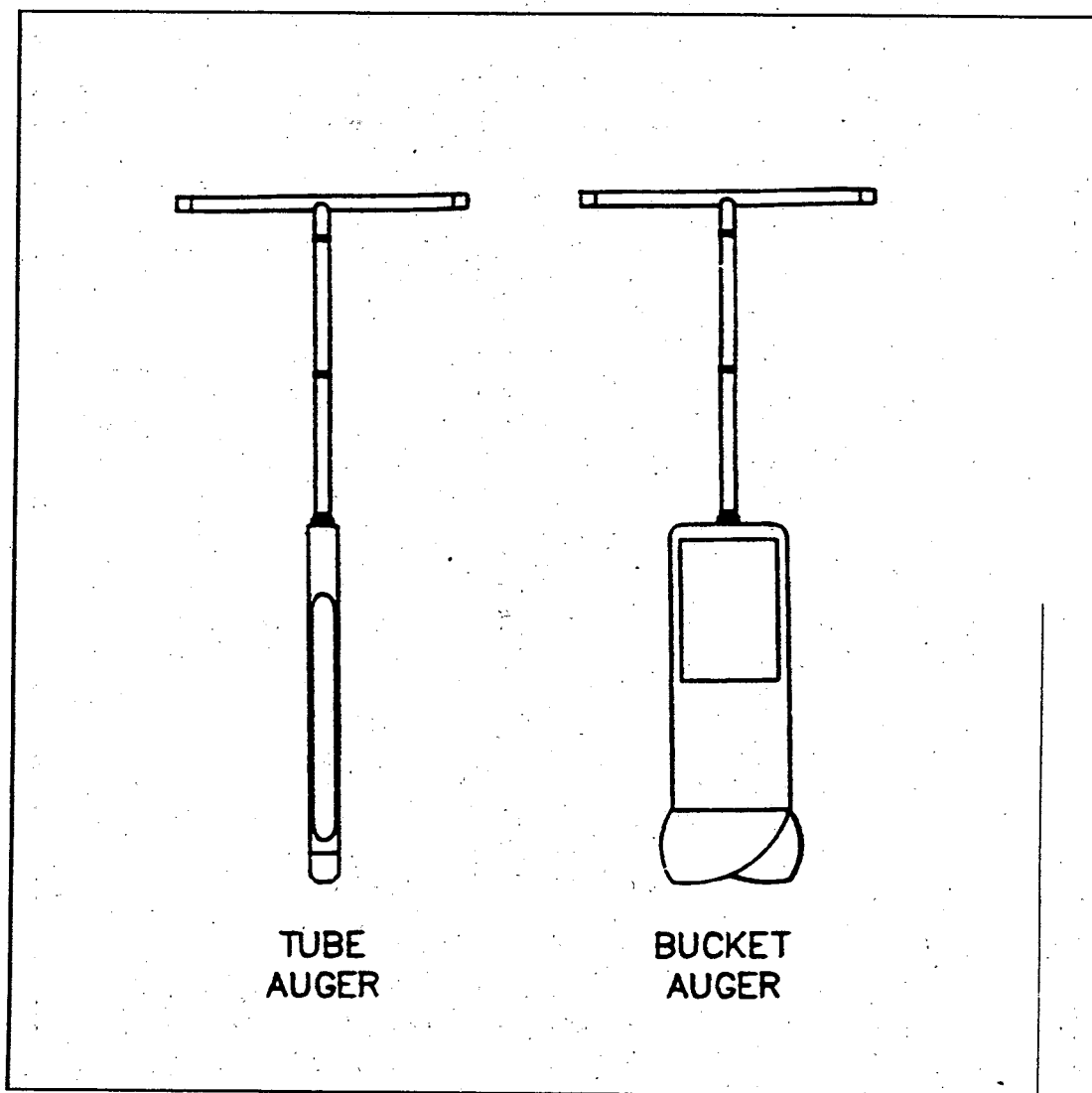
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FIGURE 1. Sampling Augers





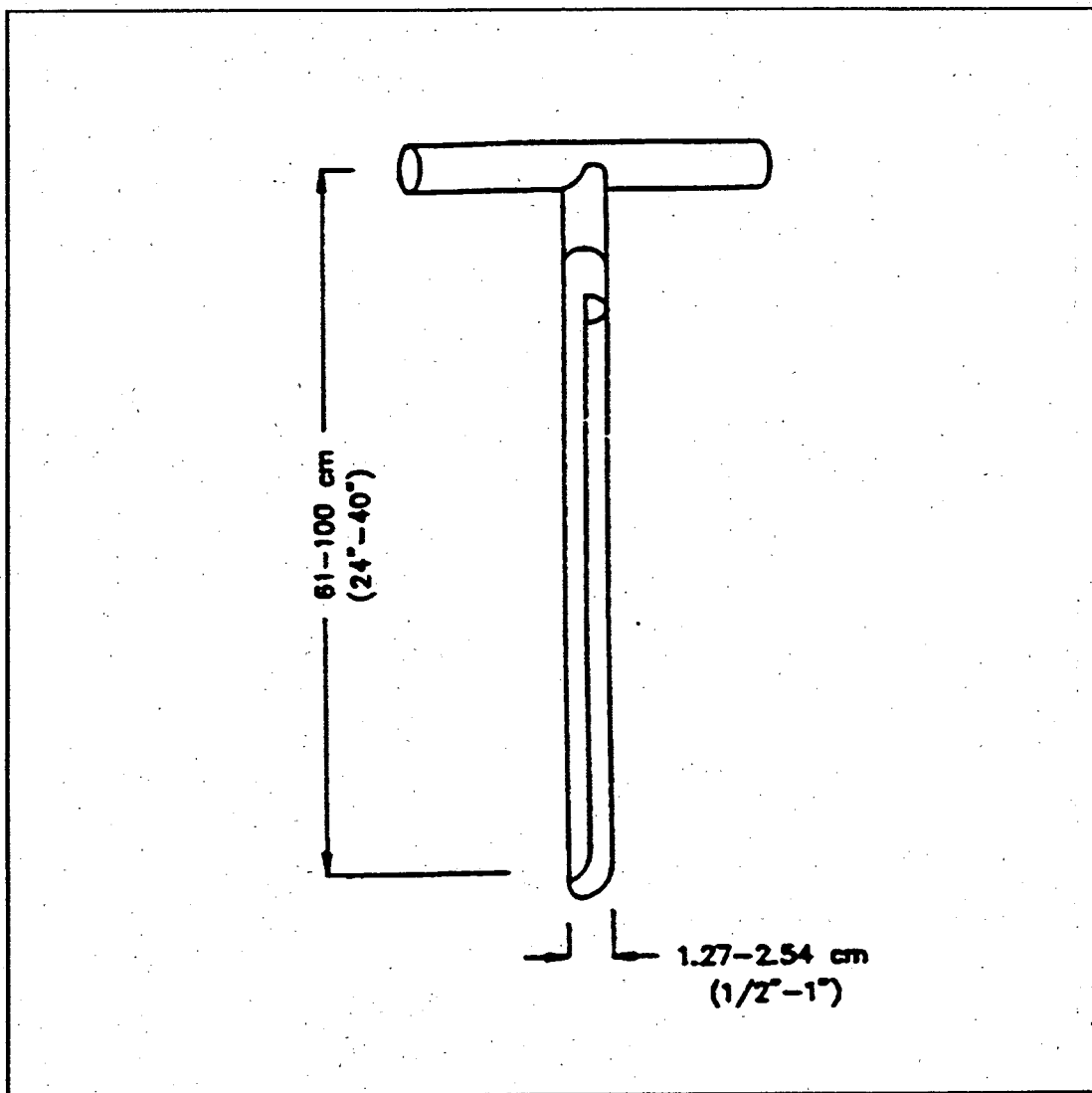
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FIGURE 2. Sampling Trier





DRUM SAMPLING

SOP#: 2009
DATE: 11/16/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to provide technical guidance on implementing safe and cost-effective response actions at hazardous waste sites containing drums with unknown contents. Container contents are sampled and characterized for disposal, bulking, recycling, segregation, and classification purposes.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Prior to sampling, drums must be excavated, (if necessary), inspected, staged, and opened. Drum excavation must be performed by qualified personnel. Inspection involves the observation and recording of visual qualities of each drum and any characteristics pertinent to the classification of the drum's contents. Staging involves the physical grouping of drums according to classifications established during the physical inspection. Opening of closed drums can be performed manually or remotely. Remote drum opening is recommended for worker safety. The most widely used method of sampling a drum involves the use of a glass thief. This method is quick, simple, relatively inexpensive, and requires no decontamination. The contents of a drum can be further characterized by performing various field tests.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples collected from drums are considered waste samples and as such, adding preservatives is not required due to the potential reaction of the sample with the preservative. Samples should, however, be cooled to 4°C and protected from sunlight in order to minimize any potential reaction due to the light sensitivity of the sample.

Sample bottles for collection of waste liquids, sludges, or solids are typically wide mouth amber jars with Teflon-lined screw caps. Actual volume required for analysis should be determined in conjunction with the laboratory performing the analysis.

Waste sample handling procedures should be as follows:

1. Label the sample container with the appropriate sample label and complete the appropriate field data sheet(s). Place sample container into two resealable plastic bags.
2. Place each bagged sample container into a shipping container which has been lined with plastic. Pack the container with enough non-combustible, absorbent, cushioning material to minimize the possibility of containers breaking, and to absorb any material which may leak.

Note: Depending on the nature and quantity of the material to be shipped, different packaging may be required. The transportation company or a shipping/receiving expert should be consulted prior to packing the samples.

3. Complete a chain of custody record for each shipping container, place into a resealable

plastic bag, and affix to the inside lid of the shipping container.

4. Secure and custody seal the lid of the shipping container. Label the shipping container appropriately and arrange for the appropriate transportation mode consistent with the type of hazardous waste involved.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

If buried drums are suspected, geophysical investigation techniques such as magnetometry or ground penetrating radar may be employed in an attempt to determine the location and depth of drums. During excavation, the soil must be removed with great caution to minimize the potential for drum rupture.

Until the contents are characterized, sampling personnel should assume that unlabelled drums contain hazardous materials. Labelled drums are frequently mislabelled, especially drums that are reused. Because a drum's label may not accurately describe its contents, extreme caution must be exercised when working with or around drums.

If a drum which contains a liquid cannot be moved without rupture, its contents may be immediately transferred to a sound drum using an appropriate method of transfer based on the type of waste. In any case, preparations should be made to contain the spill (i.e., spill pads, dike, etc.) should one occur.

If a drum is leaking, open, or deteriorated, then it must be placed immediately in overpack containers.

The practice of tapping drums to determine their contents is neither safe nor effective and should not be used if the drums are visually overpressurized or if shock-sensitive materials are suspected. A laser thermometer may be effective in order to determine the level of the drum contents via surface temperature differences.

Drums that have been overpressurized to the extent that the head is swollen several inches above the level of the chime should not be moved. A number of devices have been developed for venting critically swollen drums. One method that has proven to be effective is a tube and spear device. A light aluminum

tube (3 meters long) is positioned at the vapor space of the drum. A rigid, hooking device attached to the tube, goes over the chime and holds the tube securely in place. The spear is inserted in the tube and positioned against the drum wall. A sharp blow on the end of the spear drives the sharpened tip through the drum and the gas vents along the grooves. Venting should be done from behind a wall or barricade. Once the pressure has been relieved, the bung can be removed and the drum sampled.

Because there is potential for accidents to occur during handling, particularly initial handling, drums should only be handled if necessary. All personnel should be warned of the hazards prior to handling drums. Overpack drums and an adequate volume of absorbent material should be kept near areas where minor spills may occur. Where major spills may occur, a containment berm adequate to contain the entire volume of liquid in the drums should be constructed before any handling takes place. If drum contents spill, personnel trained in spill response should be used to isolate and contain the spill.

5.0 EQUIPMENT/APPARATUS

The following are standard materials and equipment required for sampling:

- Personal protection equipment
- Wide-mouth amber glass jars with Teflon cap liner, approximately 500 mL volume
- Other appropriate sample jars
- Uniquely numbered sample identification labels with corresponding data sheets
- Drum/Tank Sampling Data Sheets and Field Test Data Sheets for Drum/Tank Sampling
- Chain of Custody records
- Decontamination materials
- Glass thieving tubes or COLIWASA
- Coring device
- Stainless steel spatula or spoons
- Laser thermometer
- Drum overpacks
- Absorbent material for spills
- Drum opening devices

Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to

remove nearly all commonly encountered bungs. They are usually constructed of a non-sparking metal alloy (i.e., brass, bronze/manganese, aluminum, etc.) formulated to reduce the likelihood of sparks. The use of a "NON-SPARKING" wrench does not completely eliminate the possibility of a spark being produced.

Drum Deheader

One means by which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums. Drums with removable heads must be opened by other means.

Hand Pick, Pickaxe, and Hand Spike

These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most commonly used are commercially available; whereas, the spikes are generally uniquely fabricated four foot long poles with a pointed end.

Backhoe Spike

Another means used to open drums remotely for sampling is a metal spike attached or welded to a backhoe bucket. This method is very efficient and is often used in large-scale operations.

Hydraulic Drum Opener

Recently, remotely operated hydraulic devices have been fabricated to open drums. This device uses hydraulic pressure to force a non-sparking spike through the wall of a drum. It consists of a manually operated pump which pressurizes fluid through a length of hydraulic line.

Pneumatic Devices

A pneumatic bung remover consists of a compressed air supply that is controlled by a two-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill, which is adapted to turn bung fitting selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

6.0 REAGENTS

Reagents are not typically required for preserving drum samples. However, reagents will be utilized for decontamination of sampling equipment.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.

6. Use stakes, flagging, or buoys to identify and mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Drum Excavation

If it is presumed that buried drums are on-site and prior to beginning excavation activities, geophysical investigation techniques should be utilized to approximate the location and depth of the drums. In addition, it is important to ensure that all locations where excavation will occur are clear of utility lines, pipes and poles (subsurface as well as above surface).

Excavating, removing, and handling drums are generally accomplished with conventional heavy construction equipment. These activities should be performed by an equipment operator who has experience in drum excavation. During excavation activities, drums must be approached in a manner that will avoid digging directly into them.

The soil around the drum should be excavated with non-sparking hand tools or other appropriate means and as the drums are exposed, a visual inspection should be made to determine the condition of the drums. Ambient air monitoring should be done to determine the presence of unsafe levels of volatile organics, explosives, or radioactive materials. Based on this preliminary visual inspection, the appropriate mode of drum excavation and handling may be determined.

Drum identification and inventory should begin before excavation. Information such as location, date of removal, drum identification number, overpack status, and any other identification marks should be recorded on the Drum/Tank Sampling Data Sheet (Attachment 1, Appendix A).

7.3 Drum Inspection

Appropriate procedures for handling drums depend on the contents. Thus, prior to any handling, drums should be visually inspected to gain as much information as possible about their contents. The drums should be inspected for the following:

1. Drum condition, corrosion, rust, punctures, bungs, and leaking contents.

2. Symbols, words, or other markings on the drum indicating hazards (i.e., explosive, radioactive, toxic, flammable), or further identifying the drums.
3. Signs that the drum is under pressure.
4. Shock sensitivity.

Monitoring should be conducted around the drums using instruments such as radiation meters, organic vapor analyzers (OVA) and combustible gas indicators (CGI).

Survey results can be used to classify the drums into categories, for instance:

- Radioactive
- Leaking/deteriorating
- Bulging
- Lab packs
- Explosive/shock sensitive
- Empty

All personnel should assume that unmarked drums contain hazardous materials until their contents have been categorized. Once a drum has been visually inspected and any immediate hazard has been eliminated by overpacking or transferring the drum's contents, the drum is affixed with a numbered tag and transferred to a staging area. Color-coded tags, labels or bands should be used to identify the drum's category based on visual inspection. A description of each drum, its condition, any unusual markings, the location where it was buried or stored, and field monitoring information are recorded on a Drum/Tank Sampling Data Sheet (Attachment 1, Appendix A). This data sheet becomes the principal record keeping tool for tracking the drum on-site.

7.4 Drum Staging

Prior to sampling, the drums should be staged to allow easy access. Ideally, the staging area should be located just far enough from the drum opening area to prevent a chain reaction if one drum should explode or catch fire when opened.

During staging, the drums should be physically separated into the following categories: those containing liquids, those containing solids, those containing lab packs, and those which are empty.

This is done because the strategy for sampling and handling drums/containers in each of these categories will be different. This may be achieved by visual inspection of the drum and its labels, codes, etc. Solids and sludges are typically disposed of in open top drums. Closed head drums with a bung opening generally contain liquid.

Where there is good reason to suspect that drums contain radioactive, explosive, or shock-sensitive materials, these drums should be staged in a separate, isolated area. Placement of explosives and shock-sensitive materials in diked and fenced areas will minimize the hazard and the adverse effects of any premature detonation of explosives.

Where space allows, the drum opening area should be physically separated from the drum removal and drum staging operations. Drums are moved from the staging area to the drum opening area one at a time using forklift trucks equipped with drum grabbers or a barrel grapppler. In a large-scale drum handling operation, drums may be conveyed to the drum opening area using a roller conveyor. Drums may be restaged as necessary after opening and sampling.

7.5 Drum Opening

There are three basic techniques available for opening drums at hazardous waste sites:

- Manual opening with non-sparking bung wrenches
- Drum deheading
- Remote drum puncturing or bung removal

The choice of drum opening techniques and accessories depends on the number of drums to be opened, their waste contents, and physical condition. Remote drum opening equipment should always be considered in order to protect worker safety. Under OSHA 1910.120, manual drum opening with bung wrenches or deheaders should be performed **ONLY** with structurally sound drums and waste contents that are known to be non-shock sensitive, non-reactive, non-explosive, and non-flammable.

7.5.1 Manual Drum Opening with a Bung Wrench

Manual drum opening with bung wrenches (Figure 1, Appendix B) should not be performed unless the

drums are structurally sound (no evidence of bulging or deformation) and their contents are known to be non-shock sensitive, non-reactive, non-explosive or non-flammable. If opening the drum with bung wrenches is deemed safe, then certain procedures should be implemented to minimize the hazard:

- Field personnel should be fully outfitted with protective gear.
- Drums should be positioned upright with the bung up, or, for drums with bungs on the side, laid on their sides with the bung plugs up.
- The wrenching motion should be a slow, steady pull across the drum. If the length of the bung wrench handle provides inadequate leverage for unscrewing the plug, a "cheater bar" can be attached to the handle to improve leverage.

7.5.2 Manual Drum Opening with a Drum Deheader

Drums are opened with a drum deheader (Figure 2, Appendix B) by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote method prior to using the deheader.

Self-propelled drum openers which are either electrically or pneumatically driven are available and can be used for quicker and more efficient deheading.

The drum deheader should be decontaminated, as necessary, after each drum is opened to avoid cross contamination and/or adverse chemical reactions from incompatible materials.

7.5.3 Manual Drum Opening with a Hand Pick, Pickaxe, or Spike

When a drum must be opened and neither a bung

wrench nor a drum deheader is suitable, then it can be opened for sampling by using a hand pick, pickaxe, or spike (Figure 3, Appendix B). Often the drum lid or head must be hit with a great deal of force in order to penetrate it. Because of this, the potential for splash or spraying is greater than with other opening methods and therefore, this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums, some of which may be under pressure, cannot be opened slowly with these tools, spray from drums is common and appropriate safety measures must be taken. The pick or spike should be decontaminated after each drum is opened to avoid cross contamination and/or adverse chemical reaction from incompatible materials.

7.5.4 Remote Drum Opening with a Backhoe Spike

Remotely operated drum opening tools are the safest available means of drum opening. Remote drum opening is slow, but provides a high degree of safety compared to manual methods of opening.

In the opening area, drums should be placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike (Figure 4, Appendix B) should be decontaminated after each drum is opened to prevent cross contamination and/or adverse reaction from incompatible material. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This combined with the normal personal protection gear should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system.

7.5.5 Remote Drum Opening with Hydraulic Devices

A piercing device with a non-sparking, metal point is attached to the end of a hydraulic line and is pushed into the drum by the hydraulic pressure (Figure 5, Appendix B). The piercing device can be attached so that a hole for sampling can be made in either the side or the head of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place if desired and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

7.5.6 Remote Drum Opening with Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely (Figure 6, Appendix B). Prior to opening the drum, a bung fitting must be selected to fit the bung to be removed. The adjustable bracketing system is then attached to the drum and the pneumatic drill is aligned over the bung. This must be done before the drill can be operated. The operator then moves away from the drum to operate the equipment. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

7.6 Drum Sampling

After the drum has been opened, preliminary monitoring of headspace gases should be performed first with an explosimeter/oxygen meter. Afterwards, an OVA or other instruments should be used. If possible, these instruments should be intrinsically safe. In most cases it is impossible to observe the contents of these sealed or partially sealed drums. Since some layering or stratification is likely in any solution left undisturbed, a sample that represents the entire depth of the drum must be taken.

When sampling a previously sealed drum, a check should be made for the presence of a bottom sludge. This is easily accomplished by measuring the depth to apparent bottom then comparing it to the known interior depth.

7.6.1 Glass Thief Sampler

The most widely used implement for sampling drum liquids is a glass tube commonly referred to as a glass thief (Figure 7, Appendix B). This tool is cost effective, quick, and disposable. Glass thieves are typically 6mm to 16mm I.D. and 48 inches long.

Procedures for Use:

1. Remove the cover from the sample container.
2. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the sampling tube with a tapered stopper or thumb, ensuring liquid does not come into contact with stopper.
5. Carefully remove the capped tube from the drum and insert the uncapped end into the appropriate sample container.
6. Release stopper and allow the glass thief to drain until the container is approximately two-thirds full.
7. Remove tube from the sample container, break it into pieces and place the pieces in the drum.
8. Cap the sample container tightly and label it. Place the sample container into a carrier.
9. Replace the bung or place plastic over the drum.
10. Log all samples in the site logbook and on Drum/Tank Sampling Data Sheets.
11. Perform hazard categorization analyses if included in the project scope.
12. Transport the sample to the decontamination zone and package it for transport to the analytical laboratory, as necessary. Complete chain of custody records.

In many instances a drum containing waste material will have a sludge layer on the bottom. Slow insertion of the sample tube into this layer; then a gradual withdrawal will allow the sludge to act as a bottom plug to maintain the fluid in the tube. The plug can be gently removed and placed into the sample container by the use of a stainless steel lab spoon.

It should be noted that in some instances disposal of the tube by breaking it into the drum may interfere with eventual plans for the removal of its contents. The use of this technique should be cleared with the project officer or other glass thief disposal techniques should be evaluated.

7.6.2 COLIWASA Sampler

The Composite Liquid Waste Sampler (COLIWASA) and modifications thereof are equipment that collect a sample from the full depth of a drum and maintain it in the transfer tube until delivery to the sample bottle. The COLIWASA (Figure 8, Appendix B) is a much cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. One configuration consists of a 152 cm by 4 cm I.D. section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end.

Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. One model of the COLIWASA is shown in Appendix B; however, the design can be modified and/or adapted somewhat to meet the needs of the sampler.

The major drawbacks associated with using a COLIWASA concern decontamination and costs. The sampler is difficult to decontaminate in the field and its high cost in relation to alternative procedures (glass tubes) make it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.

2. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
3. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
4. Slowly withdraw the sample from the waste container with one hand while wiping the sampler tube with a disposable cloth or rag with the other hand.
5. Carefully discharge the sample into the appropriate sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
6. Cap the sample container tightly and label it. Place the sample container in a carrier.
7. Replace the bung or place plastic over the drum.
8. Log all samples in the site logbook and on Drum/Tank Sampling Data Sheets.
9. Perform hazard categorization analyses if included in the project scope.
10. Transport the sample to the decontamination zone and package for transport to the analytical laboratory, as necessary. Complete the Chain of Custody records.

7.6.3 Coring Device

A coring device may be used to sample drum solids. Samples should be taken from different areas within the drum. This sampler consists of a series of extensions, a T-handle, and the coring device.

Procedures for use:

1. Assemble the sampling equipment.
2. Remove the cover from the sample container.
3. Insert the sampling device to the bottom of the drum. The extensions and the "T" handle should extend above the drum.
4. Rotate the sampling device to cut a core of material.
5. Slowly withdraw the sampling device so that as much sample material as possible is retained within it.
6. Transfer the sample to the appropriate sample container, and label it. A stainless steel spoon or scoop may be used as necessary.
7. Cap the sample container tightly and place it in a carrier.
8. Replace the bung or place plastic over the drum.
9. Log all samples in the site log book and on Drum/Tank Sampling Data Sheets.
10. Perform hazard categorization analyses if included in the project scope.
11. Transport the sample to the decontamination zone and package it for transport to the analytical laboratory, as necessary. Complete chain of custody records.

7.7 Hazard Categorization

The goal of characterizing or categorizing the contents of drums is to obtain a quick, preliminary assessment of the types and levels of pollutants contained in the drums. These activities generally involve rapid, non-rigorous methods of analysis. The data obtained from these methods can be used to make decisions regarding drum staging or restaging, bulking or compositing of the drum contents.

As a first step in obtaining these data, standard tests should be used to classify the drum contents into general categories such as auto-reactives, water reactives, inorganic acids, organic acids, heavy metals, pesticides, cyanides, inorganic oxidizers, and organic oxidizers. In some cases, further analyses should be conducted to more precisely identify the drum contents.

There are several methods available to perform these tests:

- the HazCat[®] chemical identification system
- the Chlor-N-Oil Test Kit
- Spill-fyter Chemical Classifier Strips
- Setaflash (for ignitability)

These methods must be performed according to the manufacturers' instructions and the results must be documented on the Field Test Data Sheet for Drum/Tank Sampling (Attachment 2, Appendix A).

Other tests which may be performed include:

- Water Reactivity
- Specific Gravity Test (compared to water)
- Water Solubility Test
- pH of Aqueous Solution

The tests must be performed in accordance with the instructions on the Field Test Data Sheet for Drum/Tank Sampling and results of the tests must be documented on these data sheets.

The specific methods that will be used for hazard categorization must be documented in the Quality Assurance Work Plan.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on Chain of Custody records, Drum/Tank Sampling Data Sheets, Field Test Data Sheet for Drum/Tank Sampling, or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and corporate health and safety procedures.

More specifically, the opening of closed containers is one of the most hazardous site activities. Maximum efforts should be made to ensure the safety of the sampling team. Proper protective equipment and a general awareness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

12.0 REFERENCES

Guidance Document for Cleanup of Surface Tank and Drum Sites, OSWER Directive 9380.0-3.

Drum Handling Practices at Hazardous Waste Sites, EPA-600/2-86-013.

APPENDIX A

Attachments

ATTACHMENT 1. Drum/Tank Sampling Data Sheet

Samplers: _____ **Date:** _____

Site Name: _____ Work Order Number: 3347-040-001-_____

Container Number/Sample Number: _____ REAC Task Leader: _____

SITE INFORMATION:

1. Terrain, drainage description: _____

2. Weather conditions (from observation): _____

MET station on site: No Yes

CONTAINER INFORMATION:

1. Container type: Drum Tank Other: _____

2. Container dimensions: Shape: _____

Approximate size: _____

3. Label present: No
Yes: _____

Other Markings: _____

4. Spill or leak present: No Yes Dimensions: _____

5. Container location: (Circle one) N/A See Map Other: _____

APPENDIX A (Cont'd)**Attachments****ATTACHMENT 1. Drum/Tank Sampling Data Sheet (cont'd)****SAMPLE INFORMATION:**

1. Description: _____ liquid _____ solid (_____ powder or _____ crystals) _____ sludge

2. Color: _____ Vapors: _____

Other: _____

3. Local effects present: (damage - environmental, material) _____

FIELD MONITORING:

1. PID: _____ Background (clean zone)

_____ Probe used/Model used
_____ Reading from container opening

2. FID: _____ Background (clean zone)
_____ Reading from container opening

3. Radiation Meter:

_____ Model used
_____ Background (clean zone)
_____ Reading from container opening

4. Explosimeter/Oxygen Meter:

_____ Oxygen level from container opening
_____ LEL level from container opening

APPENDIX A (Cont'd)**Attachments****ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling**

Samplers: _____

Date: _____

Site Name: _____

Work Order Number: 3347-040-001-_____

Container Number/Sample Number: _____

REAC Task Leader: _____

SAMPLE MONITORING INFORMATION:

1. PID: _____ Background (clean zone)

_____ Probe used/Model used

_____ Reading from sample

2. FID: _____ Background (clean zone)

_____ Reading from sample

3. Radiation Meter: _____ Model used

_____ Background (clean zone)

_____ Reading from sample

4. Explosimeter/Oxygen Meter: _____ Oxygen level (sample)

_____ LEL level (sample)

SAMPLE DESCRIPTION:

_____ Liquid _____ Solid _____ Sludge _____ Color _____ Vapors

WATER REACTIVITY:

1: Add small amount of sample to water: _____ bubbles _____ color change to _____

_____ vapor formation _____ heat _____ No Change

SPECIFIC GRAVITY TEST (compared to water):

1. Add small amount of sample to water: _____ sinks _____ floats

2. If liquid sample sinks, screen for chlorinated compounds. If liquid sample floats and appears to be oily, screen for PCBs (Chlor-N-Oil kit).

APPENDIX A (Cont'd)**Attachments****ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling (cont'd)****CHLOR N OIL TEST KIT INFORMATION:**

1. Test kit used for this sample: Yes No
2. Results: _____ PCB not present _____ PCB present, less than 50 ppm
- _____ PCB present, greater than 50 ppm _____ 100% PCB present

WATER SOLUBILITY TEST:

1. Add approximately one part sample to five parts water. You may need to stir and heat gently. **[DO NOT HEAT IF WATER REACTIVE!]** Results: _____ total _____ partial _____ no solubility

pH OF AQUEOUS SOLUTION:

1. Using 0-14 pH paper, check pH of water/sample solution: _____.

SPILL-FYTER CHEMICAL CLASSIFIER STRIPS:

- | | |
|---------------------------------|---|
| 1. Acid/Base Risk: (Circle one) | <u>Color Change</u> |
| Strong acid (0) | RED |
| Moderately acidic (1-3) | ORANGE |
| Weak acid (5) | YELLOW |
| Neutral (7) | GREEN |
| Moderately basic (9-11) | Dark GREEN |
| Strong Base (13-14) | Dark BLUE |
| 2. Oxidizer Risk: (Circle one) | |
| Not Present | WHITE |
| Present | BLUE, RED, OR ANY DIVERGENCE FROM WHITE |
| 3. Fluoride Risk: (Circle one) | |
| Not Present | PINK |
| Present | YELLOW |

APPENDIX A (Cont'd)**Attachments****ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling (cont'd)****4. Petroleum Product, Organic Solvent Risk: (Circle one)**

Not Present

LIGHT BLUE

Present

DARK BLUE

5. Iodine, Bromine, Chlorine Risk: (Circle one)

Not Present

PEACH

Present

WHITE OR YELLOW

SETAFLASH IGNITABILITY TEST:

140°F

Ignitable: _____

Non-Ignitable _____

160°F

Ignitable: _____

Non-Ignitable _____

Ignitable: _____

Non-Ignitable _____

Ignitable: _____

Non-Ignitable _____

Ignitable: _____

Non-Ignitable _____

Ignitable: _____

Non-Ignitable _____

Comments:

HAZCAT KIT TESTS:

1. Test: _____

Outcome: _____

Comments:

2. Test: _____

Outcome: _____

Comments:

APPENDIX A (Cont'd)**Attachments****ATTACHMENT 2. Field Test Data Sheet for Drum/Tank Sampling (cont'd)**

3. Test: _____ Outcome: _____

Comments: _____

4. Test: _____ Outcome: _____

Comments: _____

5. Test: _____ Outcome: _____

Comments: _____
_____**HAZCAT PESTICIDES KIT:**

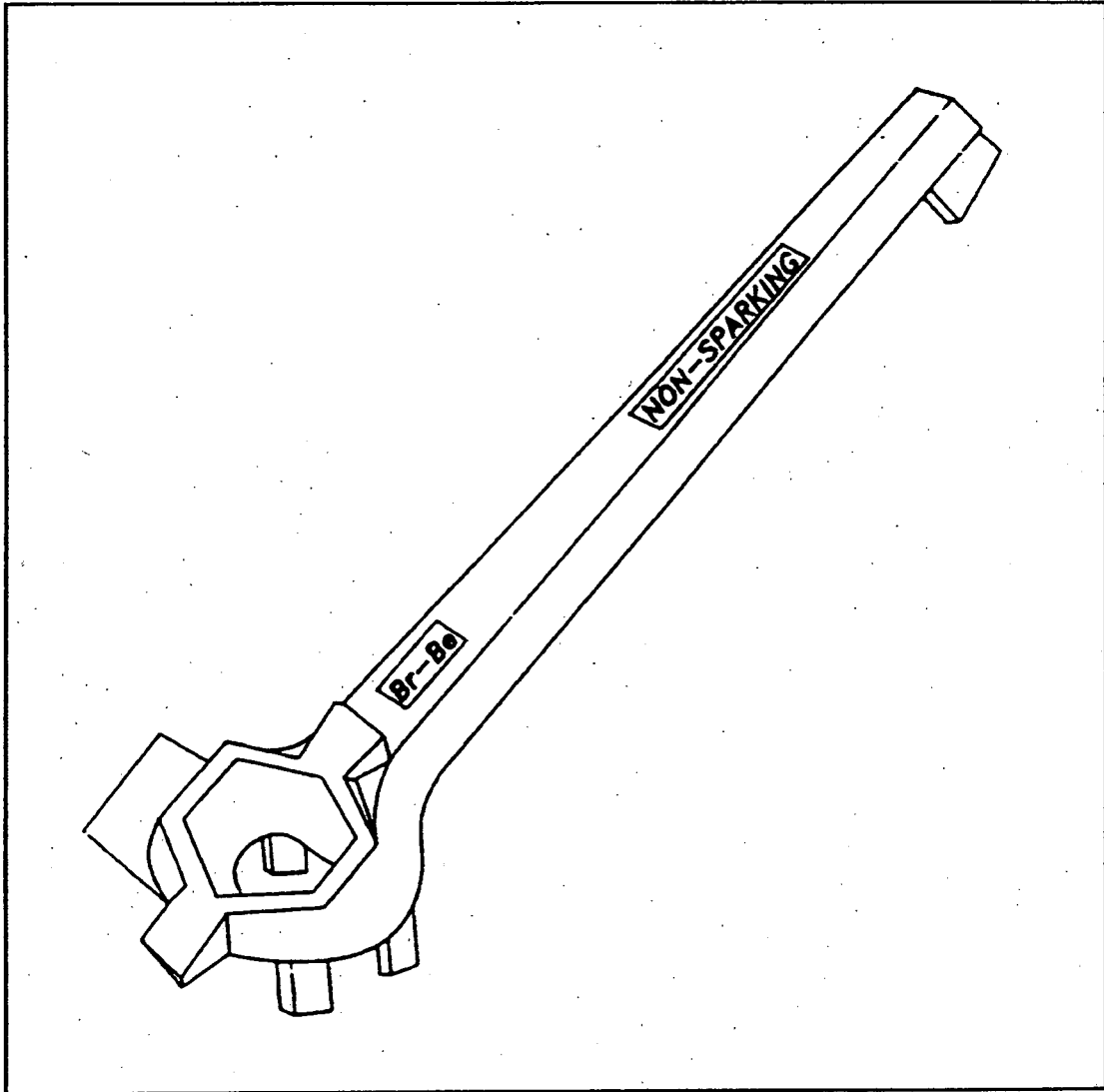
Present: _____ Not Present: _____

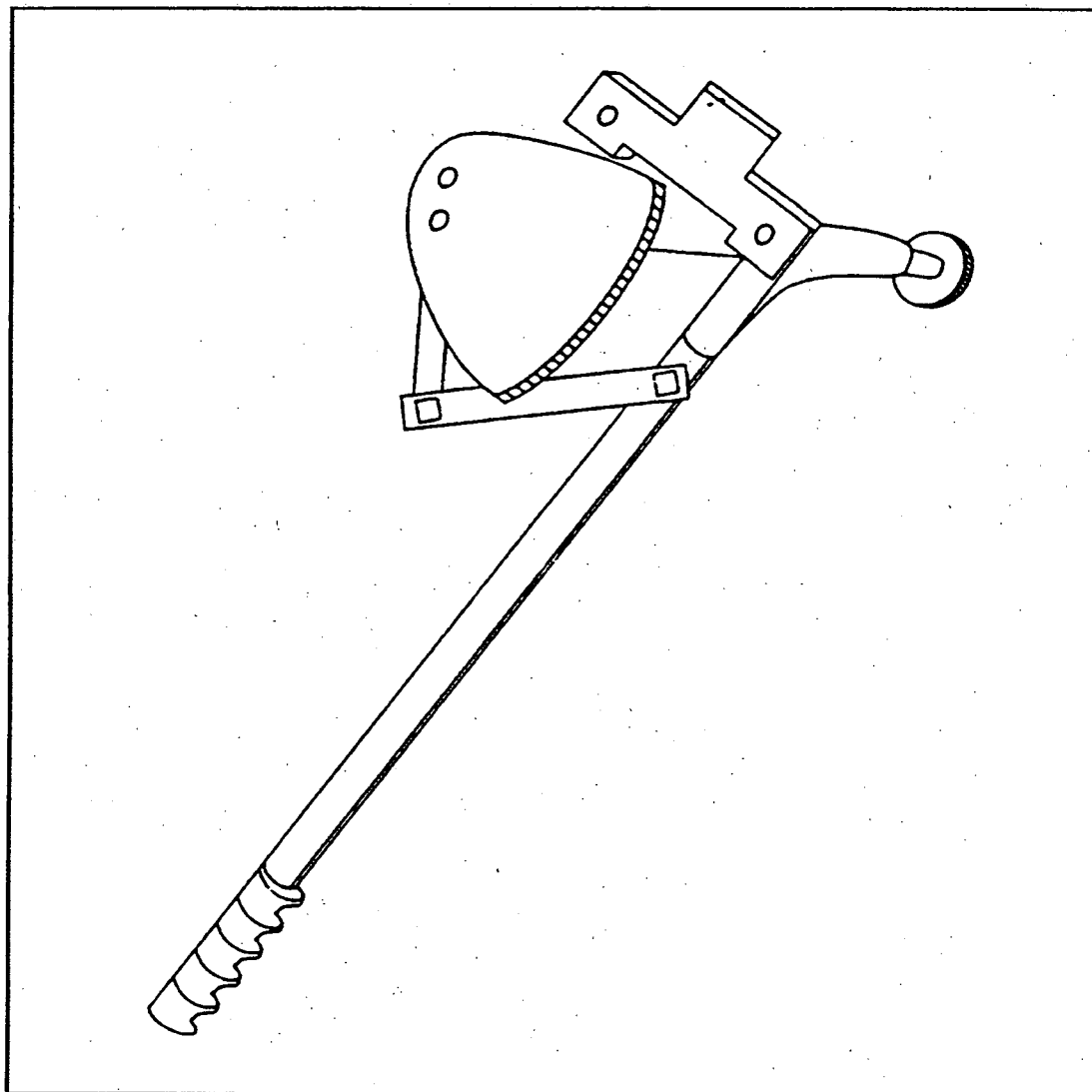
Comments: _____

APPENDIX B

Figures

Figure 1. Universal Bung Wrench

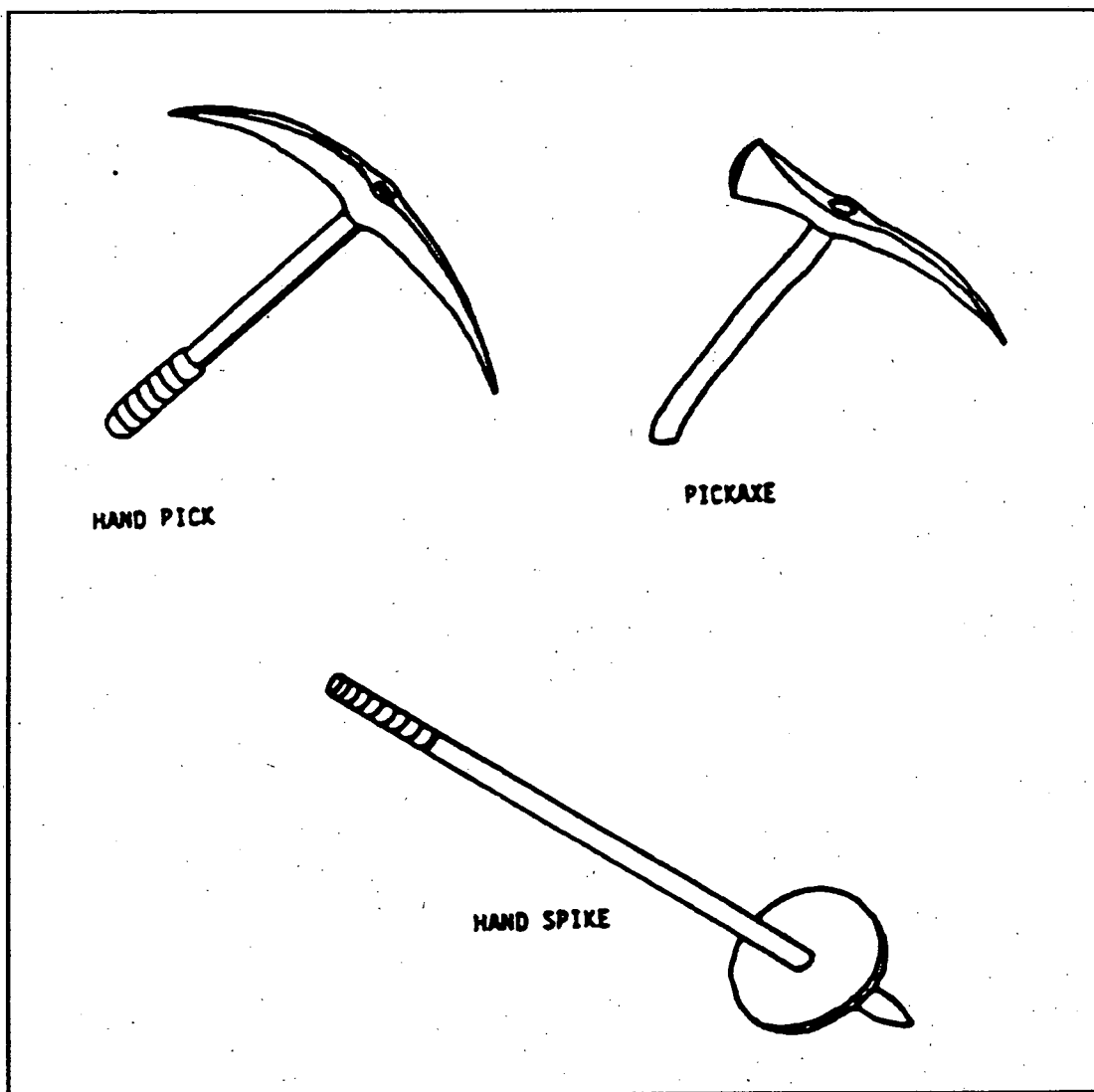


APPENDIX B (Cont'd)**Figures****Figure 2. Drum Deheader**

APPENDIX B (Cont'd)

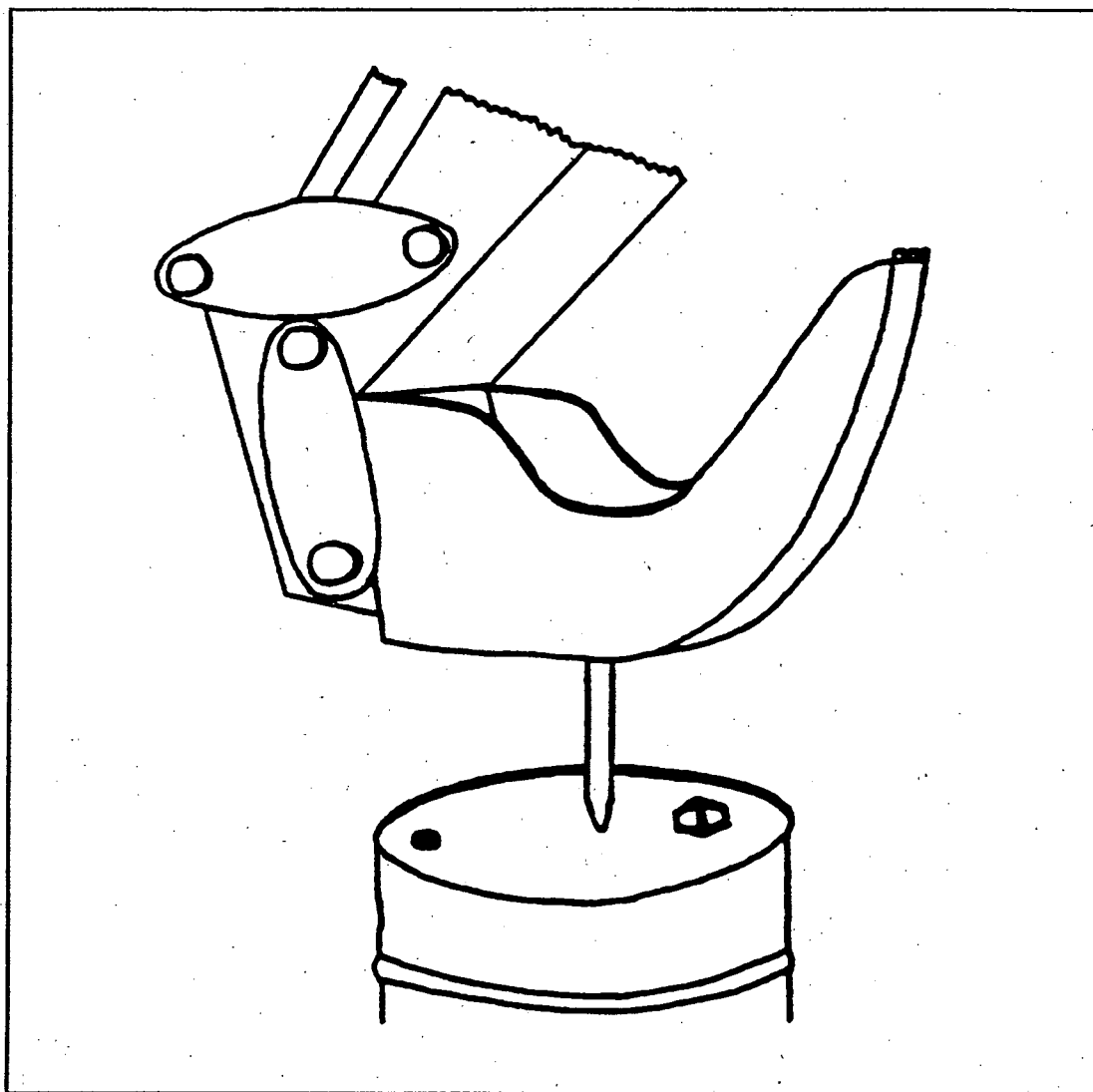
Figures

Figure 3. Hand Pick, Pickaxe, and Hand Spike



APPENDIX B (Cont'd)**Figures**

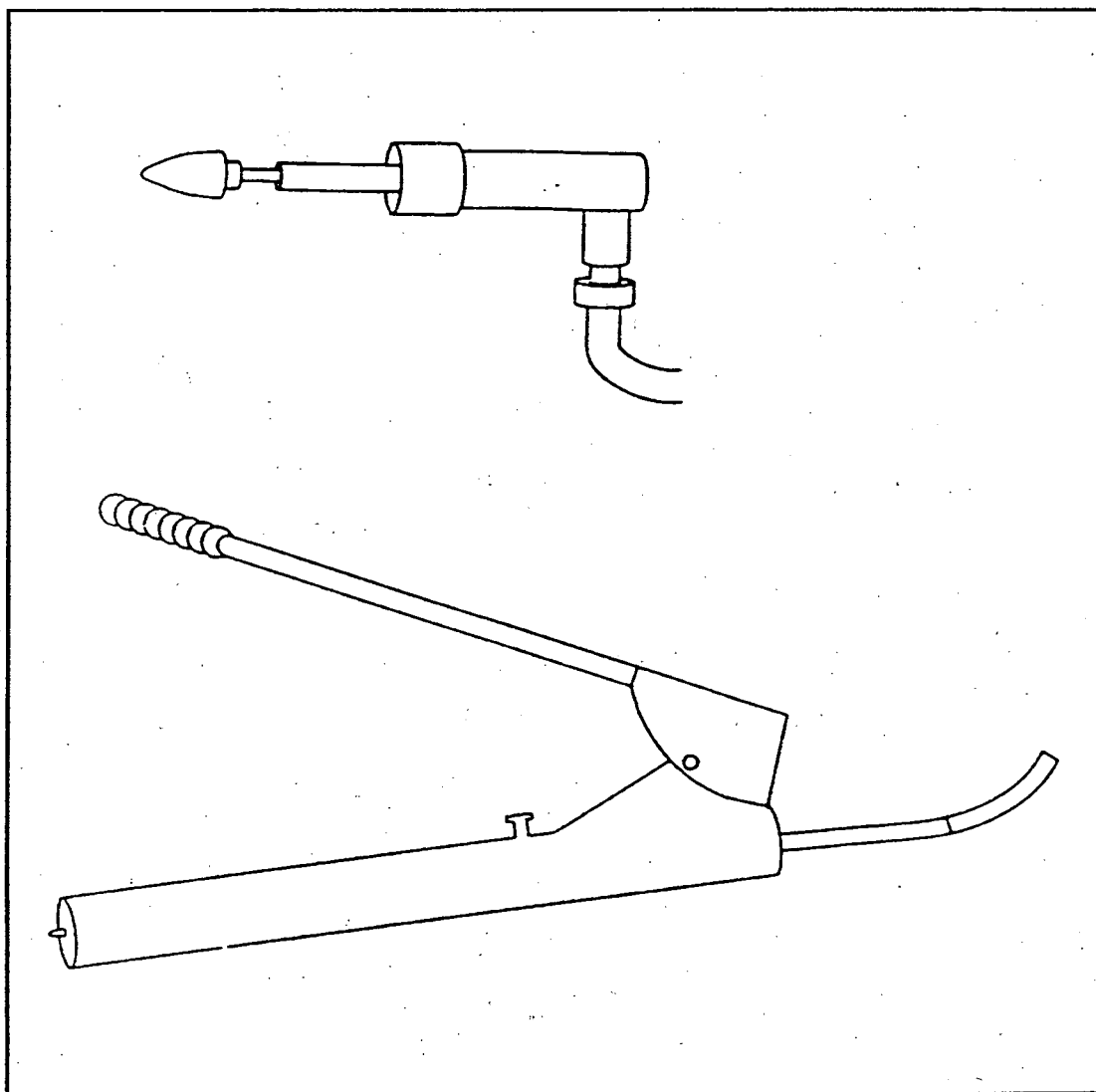
Figure 4. Backhoe Spike



APPENDIX B (Cont'd)

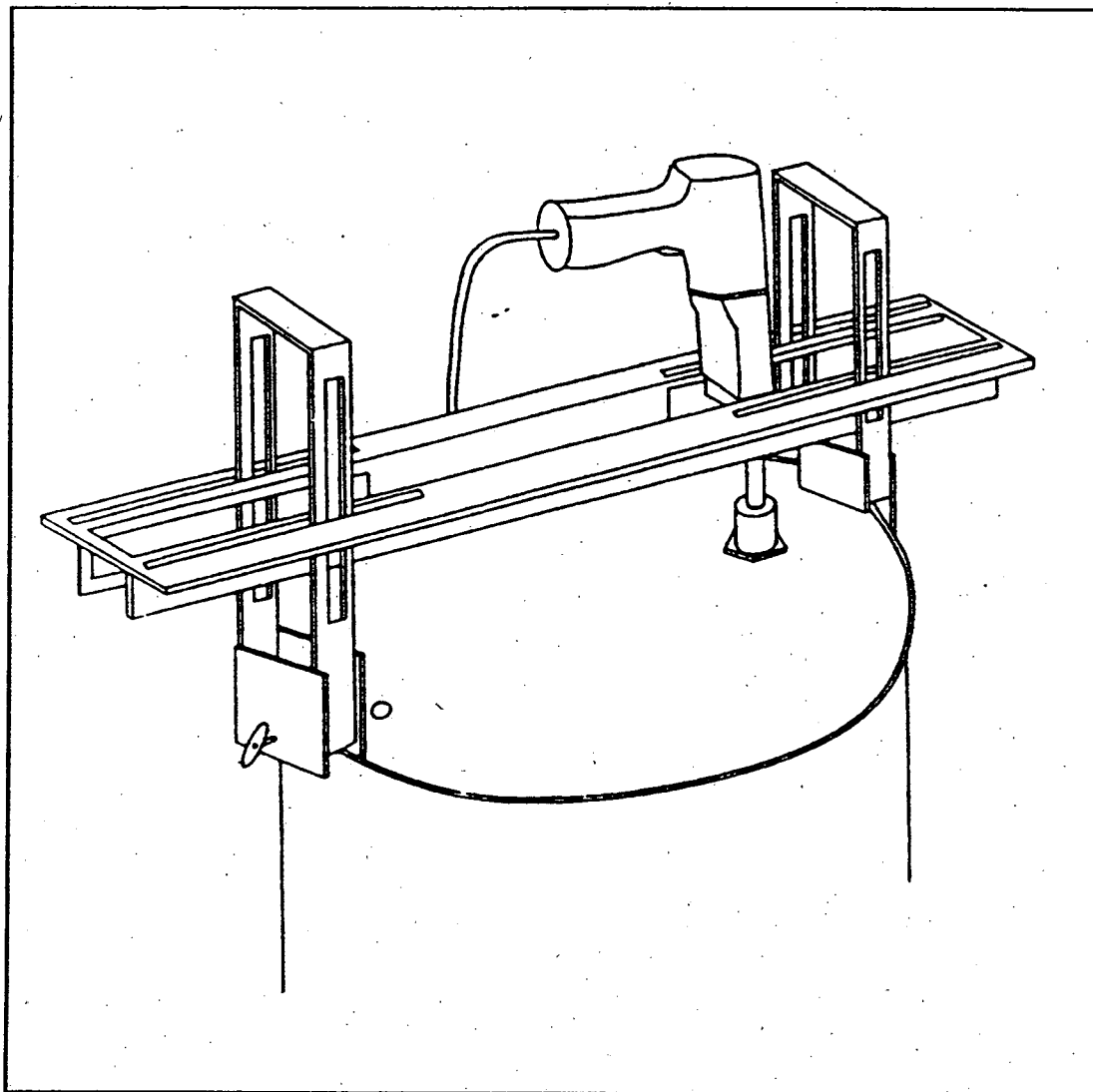
Figures

Figure 5. Hydraulic Drum Opener



APPENDIX B (Cont'd)**Figures**

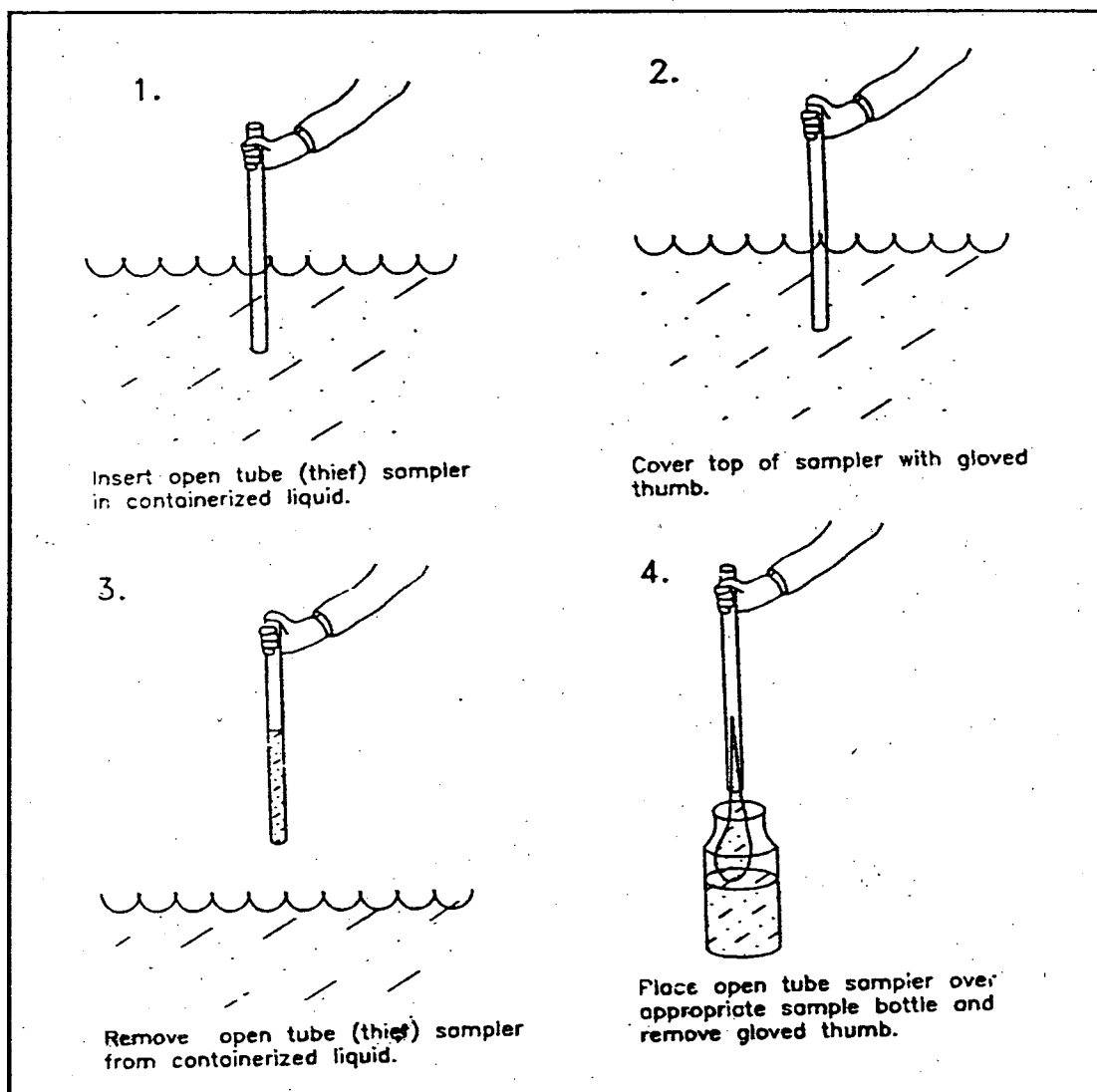
Figure 6. Pneumatic Bung Remover



APPENDIX B (Cont'd)

Figures

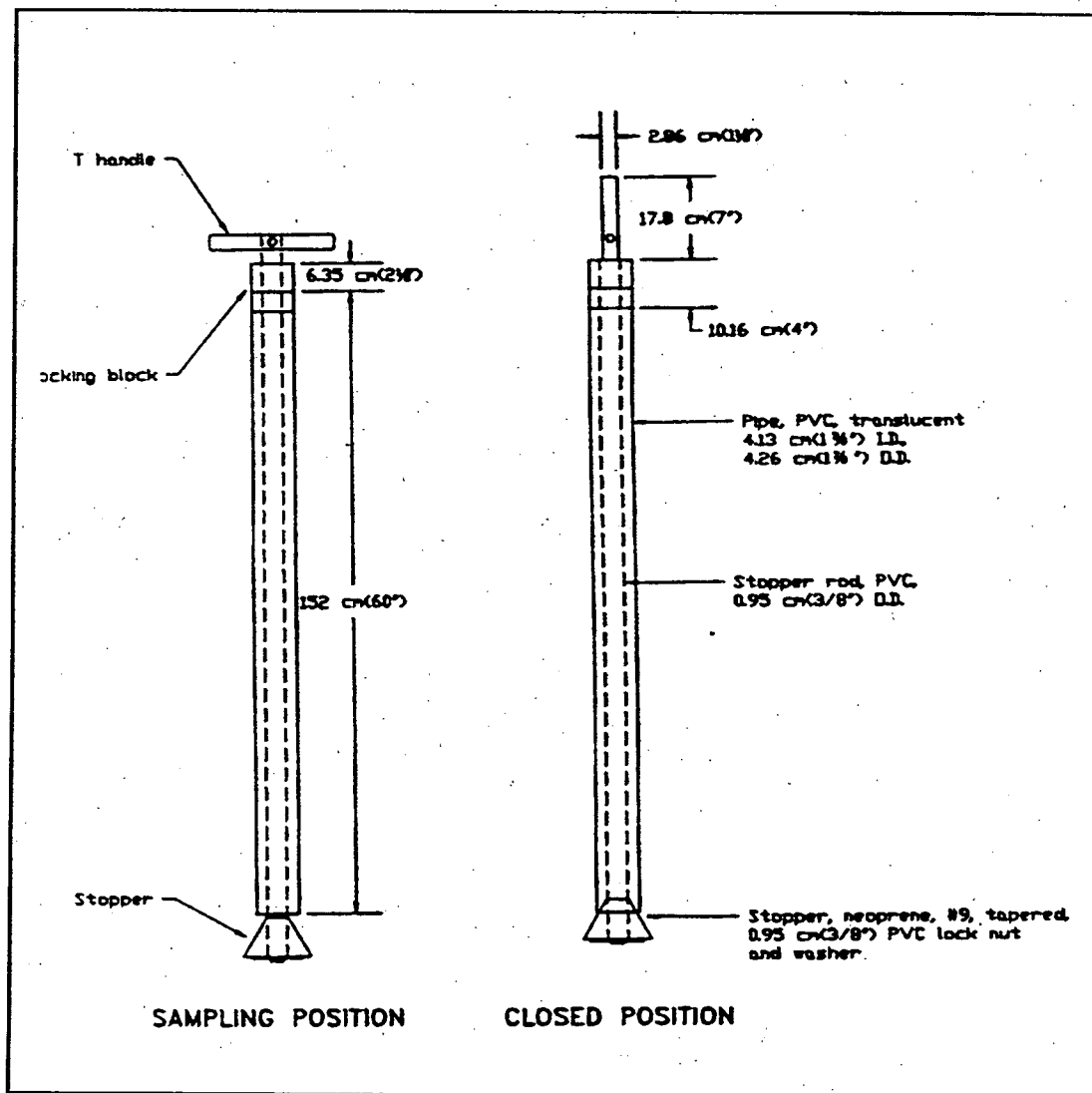
Figure 7. Glass Thief



APPENDIX B (Cont'd)

Figures

Figure 8. COLIWASA



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CHIP, WIPE, AND SWEEP SAMPLING

SOP#: 2011
DATE: 11/16/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) outlines the recommended protocol and equipment for collection of representative chip, wipe, and sweep samples to monitor potential surficial contamination.

This method of sampling is appropriate for surfaces contaminated with non-volatile species of analytes (i.e., PCB, PCDD, PCDF, metals, cyanide, etc.) Detection limits are analyte specific. Sample size should be determined based upon the detection limit desired and the amount of sample requested by the analytical laboratory. Typical sample area is one square foot. However, based upon sampling location, the sample size may need modification due to area configuration.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure or other procedure limitations. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

2.0 METHOD SUMMARY

Since surface situations vary widely, no universal sampling method can be recommended. Rather, the method and implements used must be tailored to suit a specific sampling site. The sampling location should be selected based upon the potential for contamination as a result of manufacturing processes or personnel practices.

Chip sampling is appropriate for porous surfaces and is generally accomplished with either a hammer and chisel, or an electric hammer. The sampling device should be laboratory cleaned and wrapped in clean, autoclaved aluminum foil until ready for use. To

collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/8 inch. The sample is then transferred to the proper sample container.

Wipe samples are collected from smooth surfaces to indicate surficial contamination; a sample location is measured and marked off. While wearing a new pair of surgical gloves, a sterile gauze pad is opened, and soaked with solvent. The solvent used is dependent on the surface being sampled. This pad is then stroked firmly over the sample surface, first vertically, then horizontally, to ensure complete coverage. The pad is then transferred to the sample container.

Sweep sampling is an effective method for the collection of dust or residue on porous or non-porous surfaces. To collect such a sample, an appropriate area is measured off. Then, while wearing a new pair of disposable surgical gloves, a dedicated brush is used to sweep material into a dedicated dust pan. The sample is then transferred to the proper sample container.

Samples collected by all three methods are then sent to the laboratory for analysis.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples should be stored out of direct sunlight to reduce photodegradation, cooled to 4°C and shipped to the laboratory performing the analysis. Appropriately sized laboratory cleaned, glass sample jars should be used for sample collection. The amount of sample required will be determined in concert with the analytical laboratory.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

This method has few significant interferences or problems. Typical problems result from rough porous

surfaces which may be difficult to wipe, chip, or sweep.

5.0 EQUIPMENT

Equipment required for performing chip, wipe, or sweep sampling is as follows:

- Lab clean sample containers of proper size and composition
- Site logbook
- Sample analysis request forms
- Chain of Custody records
- Custody seals
- Field data sheets
- Sample labels
- Disposable surgical gloves
- Sterile wrapped gauze pad (3 in. x 3 in.)
- Appropriate pesticide (HPLC) grade solvent
- Medium sized laboratory cleaned paint brush
- Medium sized laboratory cleaned chisel
- Autoclaved aluminum foil
- Camera
- Hexane (pesticide/HPLC grade)
- Iso-octane
- Distilled/deionized water

6.0 REAGENTS

Reagents are not required for preservation of chip, wipe or sweep samples. However, reagents will be utilized for decontamination of sampling equipment.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or preclean equipment, and ensure that it is in working order.
4. Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site specific

Health and Safety Plan.

6. Mark all sampling locations. If required the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Chip Sample Collection

Sampling of porous surfaces is generally accomplished by using a chisel and hammer or electric hammer. The sampling device should be laboratory cleaned or field decontaminated as per the Sampling Equipment Decontamination SOP. It is then wrapped in cleaned, autoclaved aluminum foil. The sampler should remain in this wrapping until it is needed. Each sampling device should be used for only one sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.
2. Record surface area to be chipped.
3. Don a new pair of disposable surgical gloves.
4. Open a laboratory-cleaned chisel or equivalent sampling device.
5. Chip the sample area horizontally, then vertically to an even depth of approximately 1/8 inch.
6. Place the sample in an appropriately prepared sample container with a Teflon lined cap.
7. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.
8. Store samples out of direct sunlight and cool to 4°C.
9. Follow proper decontamination procedures then deliver sample(s) to the laboratory for analysis.

7.3 Wipe Sample Collection

Wipe sampling is accomplished by using a sterile

gauze pad, adding a solvent in which the contaminant is most soluble, then wiping a pre-determined, pre-measured area. The sample is packaged in an amber jar to prevent photodegradation and packed in coolers for shipment to the lab. Each gauze pad is used for only one wipe sample.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.
2. Record surface area to be wiped.
3. Don a new pair of disposable surgical gloves.
4. Open new sterile package of gauze pad.
5. Soak the pad with solvent of choice.
6. Wipe the marked surface area using firm strokes. Wipe vertically, then horizontally to insure complete surface coverage.
7. Place the gauze pad in an appropriately prepared sample container with a Teflon-lined cap.
8. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site logbook and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.
9. Store samples out of direct sunlight and cool to 4°C.
10. Follow proper decontamination procedures, then deliver sample(s) to the laboratory for analysis.

7.4 Sweep Sample Collection

Sweep sampling is appropriate for bulk contamination. This procedure utilizes a dedicated, hand held sweeper brush to acquire a sample from a pre-measured area.

1. Choose appropriate sampling points; measure off the designated area. Photo documentation is optional.
2. Record the surface area to be swept.

3. Don new pair of disposable surgical gloves.
4. Sweep the measured area using a dedicated brush; collect the sample in a dedicated dust pan.
5. Transfer sample from dust pan to sample container.
6. Cap the sample container, attach the label and custody seal, and place in a plastic bag. Record all pertinent data in the site log book and on field data sheets. Complete the sampling analysis request form and chain of custody record before taking the next sample.
7. Store samples out of direct sunlight and cool to 4°C.
8. Leave contaminated sampling device in the sample material, unless decontamination is practical.
9. Follow proper decontamination procedures, then deliver sample(s) to the laboratory for analysis.

8.0 CALCULATIONS

Results are usually provided in mg/g, µg/g, mass per unit area, or other appropriate measurement. Calculations are typically done by the laboratory.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general quality assurance procedures apply:

1. All data must be documented on standard chain of custody forms, field data sheets or within the site logbook.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

The following specific quality assurance activities apply to wipe samples:

For wipe samples, a blank should be collected for each sampling event. This consists of a sterile gauze pad, wet with the appropriate solvent, and placed in a prepared sample container. The blank will help identify potential introduction of contaminants via the sampling methods, the pad, solvent or sample container. Spiked wipe samples can also be collected to better assess the data being generated. These are prepared by spiking a piece of foil of known area with a standard of the analyte of choice. The solvent containing the standard is allowed to evaporate, and the foil is wiped in a manner identical to the other wipe samples.

Specific quality assurance activities for chip and sweep samples should be determined on a site specific basis.

10.0 DATA VALIDATION

A review of the quality control samples will be conducted and the data utilized to qualify the environmental results.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow EPA, OSHA and corporate health and safety procedures.

12.0 REFERENCES

U.S. EPA, A Compendium of Superfund Field Operation Methods. EPA/540/5-87/001.

NJDEP Field Sampling Procedures Manual, February, 1988.



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1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to serve as a guide to the start-up, check out, operation, calibration, and routine use of the NITON XL722S field portable x-ray fluorescence instrument for field use in screening hazardous or potentially hazardous inorganic materials. It is not intended to replace or diminish the use of the NITON 300series & 700series User's Guide. The User's Guide contains detailed information for optimizing instrument performance and for utilizing different applications.

The procedures contained herein are general operating guidelines which may be changed as required, depending on site conditions, equipment limitations, limitations imposed by Quality Assurance\Quality Control (QA\QC) procedures or other protocol limitations. In all instances, the procedures finally employed should be documented and included in the final report.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

1.1 Principles of Operation

X-ray Fluorescence (XRF) spectroscopy is a non-destructive, qualitative and quantitative analytical technique used to determine the chemical composition of samples. In a source excited XRF analysis, primary X-rays emitted from a sealed radioisotope source are utilized to irradiate samples. During interaction with samples, source X-rays may either undergo scattering (dominating process) or absorption by sample atoms in a process known as the photoelectric effect (absorption coefficient). This phenomenon originates when incident radiation knocks out an electron from the innermost shell of an atom creating a vacancy. The atom is excited and releases its surplus energy almost instantly by filling the vacancy with an electron from one of the higher energy shells. This rearrangement of electrons is associated with the emission of X-rays characteristic (in terms of energy) of the given atom. This process is referred to as emission of fluorescent X-rays (fluorescent yield). The overall efficiency of the fluorescence process is referred to as excitation efficiency and is proportional to the product of the absorption coefficient and the fluorescent yield.

1.1.1 Characteristic X-rays

The NITON XL722S utilizes characteristic X-ray lines originating from the innermost shells of the atoms: K, L, and occasionally M. The characteristic X-ray lines of the K series are the most energetic lines for any element and, therefore, are the preferred analytical lines. The K lines are always accompanied by the L and M lines of the same element. However, with energies much lower than those of the K lines, they can usually be neglected for those elements for which the K lines are analytically useful. For heavy elements such as cerium (Ce) (atomic number, Z=58), to uranium (U, Z=92), the L lines are the preferred lines for analysis. The L_{α} and L_{β} lines have almost equal intensities, and the choice of one or the other



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depends on what interfering lines might be present. A source just energetic enough to excite the L lines will not excite the K lines of the same element. The M lines will appear together with the L lines.

The NITON User's Guide contains information about the X-rays (K or L) and elements that are measured for each excitation source.

An X-ray source can excite characteristic X-rays from an element only if the source energy is greater than the absorption edge energy for the particular line group of the element (e.g., K absorption edge, L absorption edge, M absorption edge). The absorption edge energy is somewhat greater than the corresponding line energy. The K absorption edge energy is approximately the sum of the K, L, and M line energies, and the L absorption edge energy is approximately the sum of the L and M line energies of the particular element.

Energies of the characteristic fluorescent X-rays are converted (within the detector) into a train of electric pulses, the amplitudes of which are linearly proportional to the energy. An electronic multichannel analyzer measures the pulse amplitudes, which is the basis of a qualitative X-ray analysis. The number of counts at a given energy is representative of element concentration in a sample and is the basis for quantitative analysis.

1.1.2 Scattered X-rays

The source radiation is scattered from the sample by two physical processes: coherent or elastic scattering (no energy loss), and Compton or inelastic scattering (small energy loss). Thus, source backscatter (background signal) consists of two components with X-ray lines close together. The higher energy line is equal to the source energy. Since the whole sample takes part in scattering, the scattered X-rays usually yield the most intense lines in the spectrum. Furthermore, the scattered X-rays have the highest energies in the spectrum and, therefore, contribute most of the total measured intensity signal.

1.2 Sample Types

Solid and liquid samples may be analyzed with the NITON XL722S for elements potassium (K) through uranium (U) with proper X-ray source selection, application setup, measurement conditions, and instrument calibration. Typical environmental applications are:

- Heavy metals in soil (in-situ or samples collected from the surface or from bore hole drillings, etc.), sediments, and sludges
- Heavy metal air particulates collected on membrane filters, either from personnel samplers



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or from high volume samplers.

• Lead (Pb) in paint

2.0 METHOD SUMMARY

The NITON XL722S Portable XRF Analyzer employs two radioactive isotope sources: cadmium-109 (Cd-109) and americium-241 (Am-241) for the production of primary X-rays. Each source emits a specific set of primary X-rays which excite a corresponding range of elements in a sample. When more than one source can excite the element of interest, the appropriate source is selected according to its excitation efficiency for the element of interest. Each NITON XL722S analyzer will be configured with the appropriate sources depending on the applications provided with the unit.

The sample is positioned in front of the source-detector window and sample measurement is initiated, which exposes the sample to primary radiation from the source. Fluorescent and backscattered X-rays from the sample enter through the detector window and are counted in the high-performance, solid-state detector.

Elemental concentrations are computed based on ratios of analyte X-ray intensity to source backscatter. The raw ratios are corrected for spectral overlap and interelement effects utilizing correction coefficients and iteratively computed element concentrations. The NITON XL722S is factory calibrated, and the menu-driven software supports multiple calibrations called "applications." Each application is a complete analysis configuration including elements to be measured, interfering elements in the sample, and a set of calibration coefficients.

Measurement time is user controlled. Shorter measurement times (30 - 60s) are generally used for initial screening and hot spot delineation, while longer measurement times (60 - 300s) are typically used for higher precision and accuracy requirements.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

This SOP specifically describes operating procedures for the NITON XL722S; hence, this section is not applicable to this SOP.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The total method error for XRF analysis is defined as the square root of the sum of squares of both instrument precision and user or application related error. Generally, the instrument precision is the least significant source of error in XRF analysis. User or application related error is generally more significant and will vary with each site and method used. The components of the user or application related error are the following.



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4.1 Sample Placement

This is a potential source of error because the X-ray signal decreases as the distance from the radioactive source is increased. However, this error is minimized by maintaining the same distance for each sample. Sample geometry with respect to the source/detector is also important. A tilted sample may cause analytical error. The NITON XL722S ratios analyte X-ray lines to source backscatter, which minimizes this type of error.

4.2 Sample Representivity

In order to accurately characterize site conditions, samples collected must be representative of the site or area under investigation. Representative soil sampling ensures that a sample or group of samples accurately reflects the concentration of the contaminant(s) of concern at a given time and location. Analytical results from representative samples reflect the variation in pollutant presence and concentration range throughout a site. Variables affecting sample representativeness include: (1) geologic variability, (2) contaminant concentration variability, (3) collection and preparation variability, and (4) analytical variability. Attempts should be made to minimize these sources of variability. For additional information on representative sampling, refer to the "Removal Program Representative Sampling Guidance, Volume 1 - Soil."⁽¹⁾

4.3 Reference Analysis

Soil chemical and physical matrix effects may be corrected (to some extent) by adjusting XRF results (via regression) using site-specific soil samples which have been analyzed by Inductively-Coupled Plasma (ICP) or Atomic Absorption (AA) spectroscopy methods. A major source of error can result if these samples are not representative of the site and/or if the analytical error is large. Additionally, when comparing XRF results with reference analyses results, the efficiency of the sample digestion reference analysis should be considered. Some digestion methods may breakdown different sample matrices more efficiently than others.

4.4 Chemical Matrix Effects

Chemical matrix effects result from differences in concentrations of interfering elements. These effects appear as either spectral interferences (peak overlaps) or as X-ray absorption/enhancement phenomena. Both effects are common in soils contaminated with heavy metals. For example, iron (Fe) tends to absorb copper (Cu) X-rays, reducing the intensity of Cu measured by the detector. This effect can be corrected mathematically through the use of interelement correction coefficients.

4.5 Physical Matrix Effects



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Physical matrix effects are the result of variations in the physical character of the sample. They include parameters such as particle size, uniformity, homogeneity, and surface condition. For example, consider a sample in which the analyte exists in the form of very fine particles within a matrix composed of much coarser material. If two separate aliquots of the sample are prepared in such a way that the matrix particles in one are much larger than in the other, then the relative volume of analyte occupied by the analyte-containing particles will be different in each. When measured, a larger amount of the analyte will be exposed to the source X-rays in the sample containing finer matrix particles; this results in a higher intensity reading for that sample and, consequently, an apparently higher measured concentration for that element.

4.6 Application Error

Generally, the error in the application calibration model is insignificant (relative to the other sources of error) **PROVIDED** the instrument's operating instructions are followed correctly. However, if the sample matrix varies significantly from the design of the application, the error may become significant (e.g., using the Bulk Sample [soils] application to analyze a 50 percent iron mine tailing sample).

4.7 Moisture Content

Sample moisture content affects the analytical accuracy of soils or sludges. The overall error may be secondary when the moisture range is small (5-20 percent), or it may be a major source of error when measuring the surface of soils that are saturated with water. (NOTE: attempting an in-situ measurement on a saturated soil may damage the instrument.)

4.8 Cases of Severe X-ray Spectrum Overlaps

When present in the sample, certain X-ray lines from different elements can be very close in energy and, therefore, can interfere by producing a severely overlapped spectrum.

Typical spectral overlaps are caused by the K_{β} line of element Z-1 (or as with heavier elements, Z-2 or Z-3) overlapping with the K_{α} line of element Z. This is the so-called K_{α}/K_{β} interference. Since the $K_{\alpha}:K_{\beta}$ intensity ratio for the given element usually varies from 5:1 to 7:1, the interfering element, Z-1, must be present in large concentrations in order to affect the measurement of analyte Z. For example, the presence of large concentrations of iron (Fe) could affect the measurement of cobalt (Co). The Fe K_{α} and K_{β} energies are 6.40 and 7.06 KeV, respectively. The Co K_{α} energy is 6.93 KeV. The resolution of the detector is approximately 300 eV. Therefore, large amounts of Fe in a sample will result in spectral overlap of the Fe K_{β} with the Co K_{α} peak (see Figure 1, Appendix A) and the resultant X-ray spectrum will include TOTAL counts for Fe plus Co lines.

Other interferences arise from K/L, K/M, and L/M line overlaps. While these are less common, the



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following are examples of severe overlap:

As K_{α} /Pb L_{α} , Ti K_{α} /Ba L_{α}

In the arsenic (As)/lead case, Pb can be measured from the Pb L_{α} line, and arsenic from either the As K_{α} or the As K_{β} line; this way the unwanted interference can be corrected. However, due to the limits of mathematical corrections, measurement sensitivity is reduced. Generally, arsenic concentrations can not be efficiently calculated in samples with Pb:As ratios of 10:1 or more. This may result in zero arsenic being reported regardless of what the actual concentration is.

The NITON XL722S uses overlap factors to correct for X-ray spectral overlaps for the elements of interest for a given application.

5.0 EQUIPMENT / APPARATUS

5.1 Description of the NITON XL722S System

The NITON XL722S is a complete, hand-held, portable XRF analyzer weighing less than three pounds. It utilizes the method of Energy Dispersive X-Ray Fluorescence (EDXRF) spectroscopy to determine the elemental composition of soils, sludges, particulate, paint, and other waste materials.

The NITON XL722S analyzer includes two compact, sealed radiation sources: Cd-109 and Am-241. The user selects the source and the analyzer software reports concentrations based on stored information for each application. Measurement time is user determined. The NITON XL722S utilizes a high performance, electrically-cooled, solid-state detector optimized for L-shell and K-shell X-ray detection.

The unit provides internal non-volatile memory for storage of 1000 bulk and/or thin sample spectra and multi-element analysis reports, or up to 3000 paint-mode test results. A RS-232 serial port is provided for downloading results and spectra to a PC. The multi-element analysis reports and spectra can be displayed on the instrument's display screen. The replaceable and rechargeable Nickel Metal Hydride battery pack provides for field-portable operation.

The NITON XL722S is supplied with one or more applications. The "Bulk Sample" (soil samples) application is for analysis of up to 25 metals, where the balance of the sample (that portion not directly measured by the instrument) is essentially silica (SiO_2). The "Thin Sample" application is for analysis of thin films such as air monitoring filters or wipes. The "Lead-Based Paint" application is for analyzing Pb in paint films. NITON LLC will also develop new applications to meet user specific requirements (e.g., adding elements to the "Soil Samples" application).



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The NITON XL722S is powered from its 8-hour capacity battery. The manufacturer's operating condition specifications are: Temperature range 20 to 120° Fahrenheit (F); Humidity range 0 - 95% RH.

5.2 Equipment and Apparatus List

5.2.1 NITON XL722S Analyzer System

The complete NITON XL722S Analyzer System includes:

- Hand-held analyzer unit for data acquisition, processing, and display. Includes: high-performance, solid-state detector, two excitation sources (Cd-109, Am-241), data processing software, and control panel/results display.
- RS-232C Serial I/O Interface cable
- Silicon dioxide (SiO₂) blank check sample
- Three NIST soil SRMs: 2709, 2710, and 2711, and one RCRA check sample
- Battery charger
- Two battery packs
- System carrying/shipping case and field carrying case/holster
- Soil sample analysis/preparation accessories in separate carrying/shipping case
- NITON XL722S User's Guide and NITON Xtras PC utilities software.

5.2.2 Optional Items

- 31-mm diameter sample cups
- XRF polypropylene film, 0.2 mil thick
- Windows 2000 based Personal Computer (PC)
- Spare battery packs and spare charger



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See the NITON XL722S Accessories List for additional options.

For mobile/lab or laboratory X-ray sample preparation accessories (such as drying ovens, grinders, sieves, etc.), consult general laboratory equipment suppliers.

5.3 Peripheral Devices

The NITON XL722S may be used with a PC to download results/spectra, and for customized reports.

5.3.1 Communication Cable Connection

Plug the round end of the RS-232 Serial I/O cable into the NITON XL722S connector (the connection left of the on/off/reset switch) and the 9-pin connector of the cable into the serial port of the PC.

5.3.2 NITON Xtras 5.7e Software

The PC must be running the NITON XTras v5.7e software to communicate with the NITON XL722S. The XTras software allows you to select various configurations for downloading, exporting, displaying, and reporting results/spectra. Refer to the NITON User's Guide and XTras Quickstart Guide for details.

6.0 REAGENTS

Generally, soil calibration standards are not necessary for site screening and extent of contamination analyses with the NITON XL722S. The unit's performance can be verified by analyzing the NIST soil SRMs provided with the unit. Refer to the NITON User's Guide for chemical composition of the NIST SRMs.

7.0 PROCEDURE

7.1 Operation

Refer to the NITON User's Guide for detailed instrument operating procedures and screen illustrations.

7.1.1 Startup

To remove the battery, loosen the two screws on the end of the unit below the on/off/reset switch and gently lift the battery pack away from the connector on the unit's base. Insert a fresh battery pack and tighten the set screws.



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Apply power to the NITON by sliding the on/off/reset switch to the on position. Sometimes the instrument's battery saving features momentarily delay startup. If the NITON does not turn on immediately, turn it off, wait a few seconds, and turn it on again. Each time the NITON is turned on, the Main Menu appears and the screen arrow points to **Calibrate & Test**.

Allow the NITON to warm up for a minimum of 15 minutes after it has been turned on before performing analysis.

7.1.2 Precautions

The NITON XL722S should be handled in accordance with the following radiological control practices.

Refer to the NITON User's Guide for detailed discussion of Radiation Safety practices.

1. The NITON XL722S should always be in contact with the surface of the material being analyzed, and that material should completely cover the aperture when the sources are exposed. Do not remove a sample or move the unit while the shutter is open.
2. When the sources are exposed, under no circumstances should the NITON XL722S be pointed at the operator or surrounding personnel.
3. Do not place any part of the operator's or co-worker's bodies in line of exposure when the sources are exposed or partially covered.
4. The shutter must be closed with the shutter safety lock engaged when not in use.
5. The manufacturer (NITON LLC) must be notified immediately of any condition or concern relative to the NITON XL722S's structural integrity, source shielding, source switching condition, or operability.
6. The appropriate state agency or the Nuclear Regulatory Commission (NRC) office must be notified immediately of any damage to the radioactive source, or any loss or theft of the device (see factory supplied data on radiological safety).
7. Labels or instructions on the NITON XL722S(s) must not be altered or removed.
8. The user must not attempt to open the unit.



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9. The source(s) in the unit must be wipe-tested every 6 months as described in the NITON XL722S User's Guide. The leak test certificates must be kept on file, and a copy must accompany the instrument at all times.
10. The bulk test platform or equivalent sample stage provided by NITON LLC must be used whenever the NITON XL722S is used for measuring samples contained in cups.
11. The NITON XL722S should not be dropped or exposed to conditions of excessive shock or vibration.

Additional precautions include:

1. The NITON XL722S should always be stored in its waterproof, drop-proof carrying case.
2. The battery charging unit should only be used in dry conditions.
3. Battery packs should be changed only in dry conditions.

7.2 Control Panel and Menu Software

This section outlines the control panel buttons and basic menu software. Detailed illustrations of the control panel and screen displays are in the NITON User's Guide.

7.2.1 Control Panel Buttons

The NITON control panel consists of three buttons; Clear/Enter, right arrow (->), and left arrow (<-). These buttons allow the operator to navigate all the NITON screens and menus. The amount of time that the button is held down also controls the function of the buttons. Pressing the Clear/Enter button briefly (less than 1 second) or pressing the right (->) or left (<-) arrow buttons scrolls through the listed items shown on the screen. Holding down the Clear/Enter button for a longer period (more than 3 seconds) activates a different screen.

7.2.2 The Setup Menu

The Setup Menu is used to check instrument specifications, to set date and time, to illuminate the screen continuously, or to select a different testing mode. Once set up, this screen will remain the same each time the NITON is turned on until it is reset. To activate,



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select Setup Menu from the Main Menu with the arrow buttons and press the Clear/Enter button to enter the Setup Menu. Refer to the NITON User's Guide for detailed instructions on using the Setup Menu.

7.2.3 Calibrate & Test

When the screen arrow (->) is on Calibrate & Test, press the Clear/Enter button to start the self-calibration process. This process calibrates detector energy gain/zero so that analyte X-rays are in their proper spectral location. Self-calibration takes about one to two minutes. When it is complete, the instrument will beep and the Ready to Test screen will appear. The self-calibration process should be performed every 1-2 hours during sample analysis to maintain proper detector calibration.

7.2.4 The Ready to Test Screen

This screen displays: the current date and time, the instrument serial number, the indication that the instrument is ready to test, the testing mode, the action level for "positive" or "negative" determination of lead in paint (lead based paint application only), the detector energy resolution, and the source strength.

CAUTION: Check the date and time. If they are not correct, reset them before taking any measurements (see NITON User's Guide). Readings will not be accurate unless date and time are correct.

7.2.5 The Measurement Screen

The highest concentration elements are displayed in ppm (with the two-sigma confidence intervals) on the first measurement screen. The test time is also displayed.

7.2.6 The Summary Screen

When the operator ends a reading, the Measurement Screen is replaced by the Summary Screen. Results are displayed for 14 elements on NITON XL700 series models. These are divided into two groups: detected elements, and elements that were not detected. Press the arrow buttons to scroll through the element list. An element is classified detected when the measured concentration (ppm) is at least 1.5-times the confidence interval (ie, 3-sigma). Detected elements are displayed as in the Measurement Screen. Non-detected elements are shown as "< xx", where xx is the three-sigma instrument detection limit for that sample. The instrument detection limit (3-sigma) for each element is calculated for each sample.



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7.3 Preoperational Checks

7.3.1 Energy Calibration

An energy calibration (Calibrate & Test) should be performed as required to ensure proper energy calibration (eg, after an instrument is shipped). The Calibrate & Test function is located in the Main Menu (see section 7.2.3).

7.3.2 Resolution Check

The resolution check examines the detector's ability to resolve X-ray energies. This should be performed once at the beginning of the day. Record/document the Energy Resolution in the Ready to Test screen (after Calibrate & Test). The value should not vary significantly from day to day and should typically be less than 400 eV. If the unit fails to meet this specification, call NITON LLC for assistance.

7.3.3 Blank (Zero) Sample Check

The blank (Zero) sample check is performed to monitor the instrument's zero drift in the selected application. The blank sample check only applies to the application (test mode) currently selected. This should be done once at the beginning of the day, after Calibrate & Test, after selecting a test mode, and whenever the instrument exhibits a persistent drift on a blank or low-level sample.

Load the SiO₂ Blank (supplied with the NITON unit) in the NITON Bulk Sample Test Platform. Analyze for 60 seconds (source seconds) with each source in the unit. Review results. All elemental results should be reported as non-detected (<xx, where xx is the 3-sigma instrument detection limit). Repeat the measurement if the unit fails to meet these specifications. If several elements continue to be significantly out of these specifications, check the plastic window and the blank sample for contamination. Perform the blank (Zero) sample check again. Save the results/spectra for documentation.

7.3.4 Target Element Response Check

The purpose of the target element response check is to ensure that the instrument and the selected application are working properly prior to performing sample analysis. This check should be performed at the beginning of the day. Use the NIST SRM 2709, 2710, and 2711 standards provided with the NITON unit to check the Soil Samples application. These samples should be measured using the same source acquisition times that will be used for sample analysis. Save the sample check results/spectra for documentation.



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7.4 Source Measuring Time

The source measuring time is user controlled. Generally, the element detection limit is reduced by 50 percent for every four-fold (x4) increase in source measuring time. Although counting statistics improve as measurement time increases, the practical upper limit for typical applications is about 300 seconds.

The NITON XL700 units measure time in "source seconds". This includes an automatic correction for source decay so that 60 source seconds will have a constant precision regardless of source age. The correction extends measurement time to correct for source strength lost through the decay process.

A minimum measuring time of 60 source seconds for each source is recommended when using the Soil Samples application. Measuring times for a source that excites a target element can be increased if lower detection limits are required.

7.5 Sample Handling and Presentation

When making XRF measurements, be sure to maintain constant measurement geometry in order to minimize variations in analysis results. Document any anomalies in measurement geometry, sample surface morphology, moisture content, sample grain size, and matrix (see Section 4.0).

7.5.1 Soil Samples

Soil samples may be analyzed either in-situ or in XRF sample cups (after preparation). The Soil Samples application assumes the sample to be infinitely thick. For in-situ measurements this is the case, however, for sample cup measurements it is advisable to fill the cup nearly full and use the supplied paper disk and cotton ball to hold the sample firmly against the sample cup window. This ensures that the sample is as uniformly thick as possible from analysis to analysis. The NITON XL722S bulk sample test platform or equivalent bulk sample platform provided by NITON must be used when analyzing sample cups.

An area for in-situ analysis should be prepared by removing large rocks and debris. The soil surface should be flat and compact prior to analysis. The NITON XL722S should be placed in its in-situ adaptor and held firmly on the ground to maximize contact with the ground. The unit should not be moved during analysis. Analysis of water saturated soils should be avoided. Use of varying thicknesses of plastic (bags) have been shown to interfere with light element (low atomic number) measurements and may affect the calculation of the other element concentrations.⁽²⁾ Additionally, plastic may contain significant levels of target element contamination. The NITON XL722S ratios analyte line intensity to that from source



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backscatter and, therefore, may be less susceptible to bag thickness effects. Refer to the NITON User's Guide for details on analyzing Soil Samples (Bulk Samples).

Course-grained soil conditions, or nuggets of contaminated material may preclude a truly representative sample and adversely affect the analysis results (typically by under reporting the target element). Such samples should be prepared before analysis. Preparation consistency is important to minimize variation in analytical results.

This application is designed for soil with the assumption that the balance of the material is essentially silica. If samples with a much lighter (lower atomic number) balance are analyzed, the results may be elevated by a factor of two to four. Contact NITON LLC for help in analysis of different matrices.

7.5.2 Thin (Filter) Samples

The Thin Samples application is for analysis of thin samples such as particulates on filters or wipes. The detection limits are affected by the thickness of the substrate. Best results are obtained on the thinnest substrates. Always use the Dust wipe and Filter Test platform when measuring thin samples. This is not only for user safety, but also ensures a controlled environment to facilitate testing thin samples. Contaminated material captured on filters or wipes is not usually deposited uniformly. Therefore, to produce meaningful results, several readings must be taken for each thin sample measurement. The average or sum of these readings is the reported value for the measurement. Refer to the NITON User's Guide for details on analyzing Thin Samples.

7.5.3 Lead in Paint

To analyze for lead in paint on a surface (eg, wall, counter, etc.), the area selected for analysis should be smooth, representative and free of surface dirt. The NITON XL722S should be held firmly on the surface to maximize contact. The probe should not be moved during analysis. Refer to the NITON User's Guide for details on analyzing lead paint samples.

7.6 Downloading Stored Results and Spectra

Results (analytical reports) and spectra which have been stored in the NITON XL722S internal memory should be downloaded and captured in disk files on a PC (see section 5). NITON LLC provides software (Xtras 5.7e) for this purpose. Additionally, results or spectra may be exported to text files for importing into a spreadsheet. Refer to the instructions provided with the programs for details on their operation.



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After capturing results to a file, print a copy and save both the disk files and the printout for future reference and documentation purposes.

7.7 Instrument Maintenance

NOTE: All service except exterior cleaning must be performed by NITON LLC. Do not attempt to make repairs yourself. Opening the case of the NITON will void the Warranty.

7.7.1 Exterior Cleaning

When the Kapton plastic window on the bottom of the instrument becomes dirty, the performance of the NITON unit will be affected. Clean the window gently with cotton swabs. Clean the instrument's metal case with a soft cloth. Never use water, detergents, or solvents. These may damage the instrument.

7.7.2 Further Information and Troubleshooting

Refer to the NITON XL722S User's Guide for additional detailed operational and/or maintenance and troubleshooting instructions. If no solution is found in the manual, contact NITON LLC for assistance.

An instrument log should be maintained to document specific corrective actions taken to alleviate any instrumental problems, or for recording any service that has been performed.

8.0 CALCULATIONS

The NITON XL722S is a direct readout instrument that does not require any external calculations.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

9.1 Precision

The precision of the method is monitored by reading a low- or mid-target element concentration sample (eg, a SRM or the NITON RCRA sample) at the start and end of sample analysis and after approximately every tenth sample. Determining the precision around the site action level can be extremely important if the XRF results are to be used in an enforcement action. Therefore, selection of a sample with a target element concentration at or near the site action level or level of concern is recommended. The sample is analyzed by the instrument for the normal field analysis time, and the results are recorded. A minimum of seven measurements should be made during field activities. The standard deviation for each target element is calculated. The relative standard deviation (RSD) of the sample mean can be used to calculate precision. The RSD should be within ± 20 percent.⁽³⁾



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9.2 The Method Detection Limit (MDL) and Method Quantitation Limit (MQL)

The MDL and MQL may be calculated from the measurement of either a low or blank sample (or a SRM) at the start and end of sample analysis, and after approximately every tenth sample. Alternatively, the SiO₂ blank or "clean" sand may be used if a blank soil or sediment sample is unavailable.

Measure the MDL sample using the same application and measuring time used for routine samples. A minimum of seven measurements should be made during field activities. Calculate the sample standard deviation of the mean for each target element, and round up to the next whole number prior to calculating the MDL and MQL.

The definition of the MDL is three times the calculated standard deviation value. The definition of the MQL is 10 times the calculated standard deviation value.

9.3 Reporting Results

All raw XRF data should be recorded including the individual results of multiple analyses of samples and sampling points. The average and concentration range of each multiple analysis should also be reported.

A "reported" value for each analysis or average of multiple analyses should be processed in the following manner.

1. Round the value to the same degree of significance contained in the calibration or check standard sample assay values (usually two). Round to 2 significant figures for sample results. DO NOT round results for standards used to determine MDL or RSD values (use raw data).
2. Report all values less than the MDL as not detected (U).
3. OPTIONAL: Flag and note all values greater than or equal to the MDL and less than the MQL (usually with a "J" next to the reported value).
4. Report all values equal to or greater than the MDL and within the linear calibration range.

9.4 Accuracy

Accuracy, relative to a specific digestion method and elemental analysis procedure, is determined by submitting a sample analyzed by XRF methods (prepared sample cups may be submitted) for confirmatory AA or ICP analysis at a laboratory.

The on-site analysis of soils by portable XRF instrumentation should be considered a screening effort



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only (DC1 data). Data derived from the instrument should be used with discretion. Confirmatory analyses on a subset of the screening samples (minimum 10 percent) can be used to determine if the XRF data meets DC2 data objectives. The confirmation samples should ideally be selected randomly from the sample set and include a number of samples at or near the critical level. The results of the laboratory analysis (dependent) and the XRF analysis (independent) are evaluated with a regression analysis. The coefficient of determination (r^2) should be 0.7 or greater.⁽³⁾

Correcting the XRF results based on confirmatory analyses should only be undertaken after careful consideration. The confirmatory analysis (AA or ICP) is an estimate of the concentration of metal contamination and is dependent upon the digestion method and sampling methodology used. Since XRF is a total elemental technique, any comparison with referee results must account for the possibility of variable extraction efficiency, dependent upon the digestion method used and its ability to dissolve the waste or mineral form in question.

9.5 Matrix Considerations

Other types of QA/QC verification should include verification that the instrument calibration is appropriate for the specific site to be assessed. This includes verification of potential multiple soil matrix types that may exist at a site. Matrix differences which affect the XRF measurement include large variations in calcium content, which may be encountered when going from siliceous to calcareous soils, as well as large variations in iron content.

10.0 DATA VALIDATION

10.1 Confirmation Samples

Confirmation samples are recommended at a minimum rate of 10 percent and are required if DC2 data objectives have been established for site activities.⁽³⁾ Ideally, the sample cup that was analyzed by XRF should be the same sample that is submitted for AA/ICP analysis. When confirming an in-situ analysis, collect a sample from a 6-inch by 6-inch area for both an XRF measurement and confirmation analysis.

The XRF and confirmatory AA/ICP results are analyzed with a regression analysis using a statistical program (such as SAS®) or a spreadsheet with the intercept calculated in the regression. The coefficient of determination (r^2) between XRF and AA/ICP data must be 0.7 or greater for DC2 data objectives.⁽³⁾

10.2 Recording Results

Record all results and monitoring activities in a laboratory or field notebook. Also, results may be recorded electronically on a hard drive or floppy disk.

11.0 HEALTH AND SAFETY



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When working with potentially hazardous materials, follow U.S. EPA, OSHA, corporate and/or any other applicable health and safety practices.

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APPENDIX A
Figures
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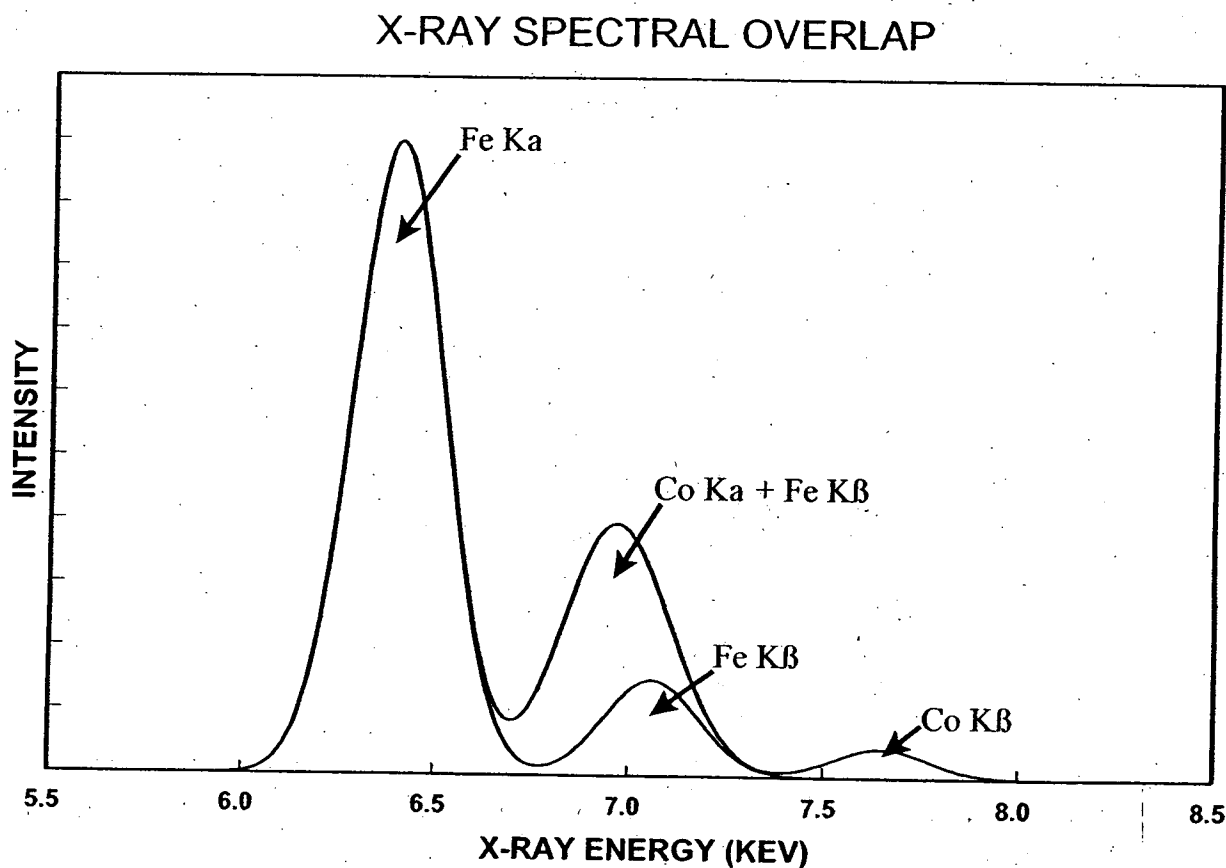


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FIGURE 1. X-Ray Spectral Plot Showing Overlap of Iron K_{α} X-Rays in the Cobalt K_{α} Measurement Region.





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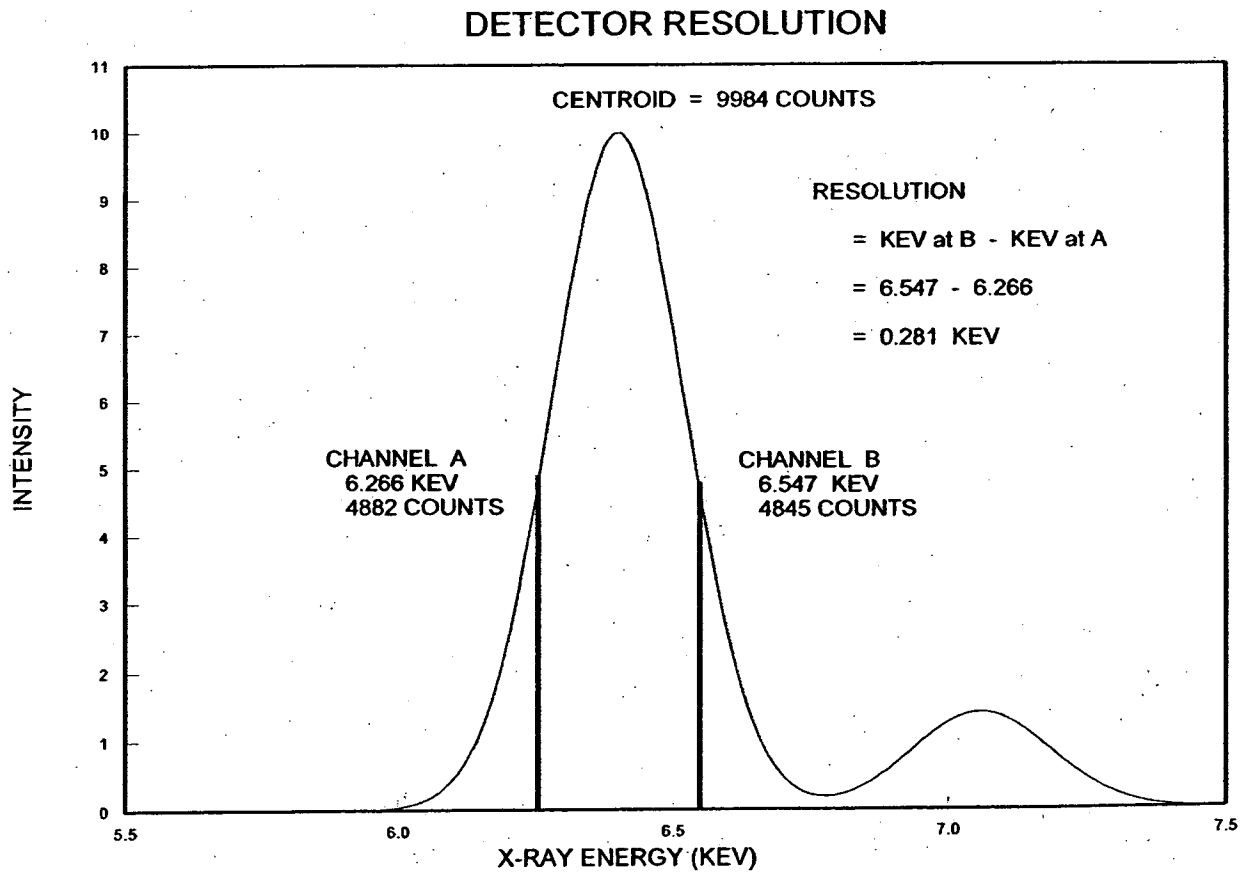
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FIGURE 2. Iron X-Ray Spectrum Illustrating Detector Resolution



ATTACHMENT C:

Drum Inventory & Field Testing Log

Drum Location Log

Air Monitoring Work Sheet

DRUM INVENTORY & FIELD TESTING LOG

SITE NAME: _____ SAMPLE #: _____ DRUM NUMBER: _____

LOGGER: _____ SAMPLER: _____ DATE/TIME: _____

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION		
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusted <input type="checkbox"/>	leaking <input type="checkbox"/>	dented <input type="checkbox"/>
Steel <input type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	perforated <input type="checkbox"/>	good <input type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input type="checkbox"/>		other _____		

DRUM SIZE (Gallons): 85 ☐ 55 ☐ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME _____

CHEMICAL NAME _____

DRUM MARKINGS _____

DRUM LABELS _____

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID _____ FID _____ RAD METER _____ OTHER _____

PHYSICAL DESCRIPTION:

Layers			Physical			Color/Description			Clarity			Solubility		Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W
H	N	I	O	L	E	Watery	Paste	Chunks	L	L	P	A	E	I	A
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	A	X	R	T
S	H	U	I	D		Soft	Hard	Powder	A	U	Q	E	A		E
E	E	I	D	G		Crystal	Granular	Rubbery	R	D	U	R	N		R
	S	D		E						Y	E		E		
Top															
Middle															
Bottom															

FIELD SCREENING RESULTS:

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top										
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

TEST COMPATIBILITY RESULTS:

Prepared by: _____

Date: _____

1

MIM2.10098

Site: _____

Date: _____

RST Member : _____

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ATTACHMENT D:

PCB Field Screening Procedure - SW 846 Method 9078

METHOD 9078

SCREENING TEST METHOD FOR POLYCHLORINATED BIPHENYLS IN SOIL

1.0 SCOPE AND APPLICATION

1.1 The method may be used to determine the amount of PCB (polychlorinated biphenyl) contamination in soils such as sand, gravel, loam, sediment, and clay, assuming that PCBs are the sole source of organic halogens in the sample.

1.2 This electrochemical method is designed to provide quantitative field results over a range of 2 to 2000 µg/g PCBs, significantly cutting down on the number of samples requiring laboratory testing.

1.3 Chlorines are removed from the PCB molecule using an organo-sodium reagent. The resulting chloride ions are measured using a chloride specific electrode. Analysts must identify the type of Aroclor contamination in order to use this as a quantitative method.

1.4 This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

2.0 SUMMARY OF METHOD

A sample of the soil to be tested is extracted with a hydrocarbon based solvent. The resulting extract is filtered to remove moisture and inorganic salts. The dried extract is reacted with metallic sodium and a catalyst to strip chloride from any PCB that may be present. The resulting chloride ions are extracted into an aqueous buffer solution where they are detected using a chloride ion specific electrode.

CAUTION: Some of the reagents used with this testing procedure contain flammable solvents, dilute acids, and metallic sodium. Wear gloves and safety glasses while performing tests. Read all MSDS and warnings included with the instrument before starting testing procedure.

3.0 INTERFERENCES

3.1 This procedure is sensitive to any chlorinated compound that is preferentially soluble in a non-polar solvent. When analyzing for PCBs, the presence of other chlorinated organics will result in a high bias. Iodine and bromine containing compounds will affect results if present in significant quantities. Wet or dry samples may be run, but results for all samples are calculated on a wet-weight basis. In one evaluation study (Table 1), 1.4% of the measurements were false negatives.

3.2 Inorganic chlorides should not interfere using this method if the sample is extracted with organic solvent.

4.0 APPARATUS AND MATERIALS

Electrochemical PCB test kit: L2000® PCB/Chloride Analyzer, (Dexsil Corporation, One Hamden Park Drive, Hamden, CT), or equivalent. Each commercially available test kit will supply or specify the apparatus and materials necessary for successful completion of the test.

5.0 REAGENTS

Each commercially available test kit will supply or specify the reagents necessary for successful completion of the test. Reagents should be labeled with appropriate expiration dates.

6.0 SAMPLE COLLECTION AND HANDLING

6.1 See the introductory material to this chapter, Organic Analytes, Sec. 4.1.

6.2 Soil samples may be contaminated, and should therefore be considered hazardous and handled accordingly. All samples should be collected using a sampling plan that addresses the considerations discussed in Chapter Nine.

6.3 To achieve accurate analyses, soil samples should be well homogenized prior to testing. PCBs are generally not evenly distributed in a soil sample and extensive mixing must be done to assure consistency.

7.0 PROCEDURE

Follow the manufacturer's instructions for the test kit being used. Those test kits used must meet or exceed the performance specifications indicated in Tables 1 and 2.

8.0 QUALITY CONTROL

8.1 Follow the manufacturer's instructions for quality control procedures specific to the test kit used. Additionally, guidance provided in Chapter One should be followed.

8.2 Use of replicate analyses, particularly when results indicate concentrations near the action level, is recommended to refine information gathered with the kit.

8.3 Method 9078 is intended for field or laboratory use. The appropriate level of quality assurance should accompany the application of this method to document data quality.

9.0 METHOD PERFORMANCE

9.1 146 soil samples from a PCB contaminated site were analyzed. There were 114 individual samples and 32 field duplicates. Each sample was analyzed using both the L2000 and GC/MS. The L2000 analyses were performed on-site in a mobile lab and the PCBs were analyzed as Aroclor 1242. Laboratory analyses were performed on splits of the same samples. The results from the analyses are presented in Table 1.

9.2 After applying accepted statistical methods to account for the detection limit difference between the two methods the data were evaluated to determine the acceptability of the L2000 method. A matched-pair students t-test performed on the L2000 and CLP GC/MS data results in a t value of 0.2141. This is well below the critical value (1.645 @ 0.05) for rejecting the null hypothesis indicating that there is no statistical difference between the data pairs. An analysis of the data for outliers identified only 2 data points whose residuals were greater than 3 standard deviations (10 and 5 respectively). Both points were determined to be in error using other evidence and were eliminated from the data set. A linear regression analysis of the remaining data results in a correlation coefficient of 0.95 and a positive intercept of 10.98 $\mu\text{g/g}$. The slope of 0.985 was not statistically different from 1 and the intercept was not statistically different from 0.

9.3 The relative percent difference (RPD) calculated from all valid duplicates greater than the L2000 detection limit of 2 $\mu\text{g/g}$ for each method resulted in a mean RPD of 19% for the L2000 data and a mean RPD of 43% for the CLP GC-MS method. A Dunnett's test shows that this is statistically significant.

9.4 In a second study, soil samples contaminated with Aroclor 1260 were taken during a site cleanup. The samples were split and sent for lab analysis by Method 8082 as well as analysis by the L2000 in the field. The results are reported in Table 2. A linear regression analysis of the data resulted in a correlation coefficient of 0.995, a slope of 1.048 and an intercept of -1.48 $\mu\text{g/g}$ indicating that the L2000 is accurate compared to the lab method. A calculation of the relative percent difference for data, where duplicates were run within a method, results in a lower RPD for the L2000 indicating a tighter data spread and better repeatability.

10.0 REFERENCE

1. Griffin, Roger D. Application of a New PCB Field Analysis Technique for Site Assessment. Proceedings of Hazmacon '92 March - April 1992.

TABLE 1
COMPARISON OF L2000 AND GC/MS RESULTS FROM SPLIT SAMPLES
Summary of Results

Sample Number	L2000 (µg/g)	GC/MS (µg/g)	Results Agree?
1	ND	0.593	Yes
3	ND	0.114	Yes
4	23.6	6.71	Yes
6	ND	0.679	Yes
7	ND	0.552	Yes
8	3.9	2	Yes
9	6.9	1.3	Yes
10	5.1	0.172	Yes
11	2.7	1.15	Yes
15	9.4	9.13	Yes
15D	12.5	9.84	Yes
16	484	2110	Yes
17	6.5	2.55	Yes
18	382	45.4	Yes
19	71.1	6.7	False Pos.
23	48.8	20.8	Yes
25	3.5	11.7	Yes
32	36	47.6	Yes
33	ND	6	Yes
34	14.4	34	Yes
36	>2000	816	Yes
38	778	1030	Yes
40	5.7	4.25	Yes
43	4.1	1.69	Yes
43D	3.6	1.74	Yes
50	ND	3.6	Yes
50D	ND	4.4	Yes
52	9.3	4.21	Yes
53	25.7	0.958	False Pos.
54	5.1	0.516	Yes
55	4.4	2.4	Yes
59	ND	7.9	Yes
60	2.3	0.624	Yes
60D	4.4	0.577	Yes
61	549	580	Yes

TABLE 1 (cont.)

Sample Number	L2000 (µg/g)	GC/MS (µg/g)	Results Agree?
62	111	2.35	False Pos.
64	172	19	Yes
65	ND	3.1	Yes
66	2.1	1.98	Yes
67	7.5	0.081	Yes
68	8	0.504	Yes
69	5.8	ND	Yes
69D	4.4	ND	Yes
73	37	15.8	Yes
74	22	13.3	Yes
75	61	23	Yes
76	82	46.7	Yes
78	21	2.27	Yes
79	148	42.8	Yes
80	ND	3.8	Yes
84	7.6	1.16	Yes
84D	10.9	1.08	False Pos.
85	593	428	Yes
85D	596	465	Yes
88	ND	2.7	Yes
88D	ND	1.77	Yes
89	ND	45	False Neg.
90	2	1.01	Yes
90D	ND	1.4	Yes
91	1650	1630	Yes
91D	1608	1704	Yes
92	3.14	1.21	Yes
92D	3.4	ND	Yes
95	20.6	17.5	Yes
95D	20.1	31.2	Yes
100	384	177	Yes
100D	363	167	Yes
101	8.3	1.21	Yes
102	6.3	293	False Neg.
102D	5	1.77	Yes
103	75.2	40.3	Yes
104	4.1	7.66	Yes

TABLE 1 (cont.)

Sample Number	L2000 ($\mu\text{g/g}$)	GC/MS ($\mu\text{g/g}$)	Results Agree?
107	161	14.1	Yes
108	6.1	3.84	Yes
109	P	ND	Yes
109D	10.3	ND	False Pos.
111	20	ND	False Pos.
112	240	315	Yes
113	21.8	14.9	Yes
114	107	66.3	Yes

NOTE: 75 out of 146 samples are reported in Table 1. Samples that were found to be ND for both the L2000 kit and the GC/MS determination were not reported. The determination of a "false negative" result for the L2000 technique is based on an action level of 10 $\mu\text{g/g}$. If another action limit is chosen, the rate of false negative results may differ. Similarly, a "false positive" result for the L2000 technique is indicated when the L2000 results are above 10 $\mu\text{g/g}$ and the GC/MS results are "ND" or below 10 $\mu\text{g/g}$, or when the results of the L2000 techniques are higher than the GC/MS results by more than two orders of magnitude.

ND = Not detected

6 False positives: ND - 14.1 ppm by GC/MS

2 False negatives: 2.7 - 293 ppm by GC/MS

71 Non-detects: ND - 2.5 ppm by GC/MS

TABLE 2
COMPARISON OF L2000 AND GC/EC RESULTS FROM SPLIT SAMPLES
Summary of Results

Sample Number	Method 8082 (µg/g)	L2000 Results (µg/g)
1	83	79/76
2	21	22
3	12	14
4	300/375	357/326/327
5	29	27
6	106/134	116/117
7	3	7.6
8	9.3	7.2
9	1.5	5.2
10	99	93
11	7/9	13
12	3.6	12
13	4.2/6.2	2.9
14	290	254/265

ATTACHMENT 1
SOP NO. HW-6

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CLP DATA ASSESSMENT

Functional Guidelines for Evaluating Organic Analysis

CASE No.: 34156
LABORATORY: A4

SDG No.: B1ZT0
SITE: Matteo and Son Inc.

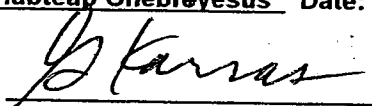
DATA ASSESSMENT

The current SOP HW-6 (Revision 12) March 2001, USEPA Region II Data Validation SOP for Statement of Work OLMO 4.3 for evaluating organic data have been applied.

All data are valid and acceptable except those analytes rejected "R"(unusable). Due to the detection of QC problems, some analytes may have the "J" (estimated), "N"(presumptive evidence for the presence of the material, "U" (non-detect) or "JN" (presumptive evidence for the presence of the material at an estimated value) flag. All action is detailed on the attached sheets.

The "R" flag means that the associated value is unusable. In other words, significant data bias is evident and the reported analyte concentration is unreliable.

Reviewer's 
Signature: Habteab Ghebreyesus Date: June 30, 2005

Verified By:  Date: 6/30/05

CLP DATA ASSESSMENT

B1ZT0

1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detects (sample quantitation limits) will be flagged as estimated, "J", or unusable, "R", if the holding times are grossly exceeded.

The following action was taken in the samples and analytes shown due to excessive holding time.

DC-4 The following pesticide soil samples are outside primary extraction holding time criteria. Hits are qualified "J" and non-detects are qualified "UJ".

B1ZT0, B1ZT0DL, B1ZT1, B W3, B1ZW4, B1ZW4DL, B1ZW5, B1ZW5DL, B1ZW6, B1ZW6DL, B1ZW71ZT1DL, B1ZT2, B1ZT3, B1ZT3DL, B1ZT4, B1ZT4DL, B1ZT5, B1ZT6, B1ZT6DL, B1ZT6MS, B1ZT6MSD, B1ZT7, B1ZT7DL, B1ZT8, B1ZT9, B1ZT9DL, B1ZW0, B1ZW0DL, B1ZW1, B1ZW1DL, B1ZW2, B1ZW2DL, B1Z, B1ZW8, B1ZW8DL, B1ZW9

2. SURROGATES

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

DC-2 The following pesticide samples have surrogate percent recoveries which exceed the upper limit of the criteria window. If %R for both surrogates on both column are > contract limit, hits are flagged "J".

B1ZT0, B1ZT0DL, B1ZT1, B1ZT1DL, B1ZT3, B1ZT3DL, B1ZT4, B1ZT4DL, B1ZT5, B1ZT6, B1ZT6DL, B1ZT6MS, B1ZT6MSD, B1ZT7, B1ZT7DL, B1ZT9, B1ZT9DL, B1ZW0, B1ZW0DL, B1ZW1, B1ZW1DL, B1ZW2, B1ZW2DL, B1ZW4, B1ZW4DL, B1ZW5, B1ZW5DL, B1ZW6, B1ZW6DL, B1ZW8, B1ZW8DL, B1ZW9

DC-5 The following pesticide samples have surrogate percent recoveries outside the lower limit of the criteria window, but greater than 10%. Hits are qualified "J" and non-detects are qualified "UJ".

B1ZT4

3. MATRIX SPIKE/SPIKE DUPLICATE, MS/MSD:

The MS/MSD data are generated to determine the long term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for additional qualification of data.

No qualification based on MS/MSD data.

4. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any

CLP DATA ASSESSMENT

contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field and rinse blanks measure cross-contamination of samples during field operations. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for common contaminants), the analytes are qualified as non-detects, "U". The following analytes in the sample shown were qualified with "U" for these reasons:

A) Method blank contamination:
No contamination in method blank.

B) Field or rinse blank contamination:

No field blank for this SDG.

C) Trip blank contamination for VOA aqueous samples:

Not applicable.

D) Storage Blank associated with VOA samples only

Not applicable.

E) Tics "R" rejected
Not applicable.

5. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is (BFB) Bromofluorobenzene and for semi-volatiles Decafluorotriphenyl-phosphine (DFTPP).

If the mass calibration is in error, all associated data will be classified as unusable "R".

Not applicable.

6. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) Response Factor GC/MS:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be ≥ 0.05 in both initial and continuing

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calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected "R".

B) Percent Relative Standard Deviation (%RSD) and Percent Difference (%D):

Percent RSD is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent D compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be $< 30\%$ and %D must be $< 25\%$. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J" and non-detects are flagged "UJ". If %RSD and %D grossly exceed QC criteria, non-detects data may be qualified "R".

For the PEST/PCB fraction, if %RSD exceeds 20% for all analytes except for the two surrogates (which must not exceed 30% RSD), qualify all associated positive results "J" and non-detects "UJ".

The following analytes in the sample shown were qualified for %RSD and %D:

DC-16 The following pesticide samples are associated with a three point initial calibration in which the % RSD of calibration factors for a target compound exceeded expanded criteria. Hits are qualified "J" and non-detects are qualified "UJ".

delta-BHC

B1ZT5, B1ZW1, B1ZW1DL, B1ZW2, B1ZW2DL, B1ZW8

Endrin ketone

B1ZT0, B1ZT0DL, B1ZT1, B1ZT1DL, B1ZT2, B1ZT3, B1ZT3DL, B1ZT4, B1ZT4DL, B1ZT6, B1ZT6DL, B1ZT6MS, B1ZT6MSD, B1ZT7, B1ZT7DL, B1ZT8, B1ZT9, B1ZT9DL, B1ZW0, B1ZW0DL, B1ZW3, B1ZW4, B1ZW4DL, B1ZW5, B1ZW5DL, B1ZW6, B1ZW6DL, B1ZW7, B1ZW8DL, B1ZW9, PBLK8W

7. INTERNAL STANDARDS PERFORMANCE GC/MS:

Internal standards (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every experimental run. The internal standard area count must not vary by more than a factor of 2 (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary more than ± 30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated, "J", and all non-detects as "UJ", or "R" if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgement to determine either partial or total rejection of the data for that sample fraction.

No problems found for this qualification.

8. COMPOUND IDENTIFICATION:**A) Volatile and Semi-Volatile Fractions:**

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TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TIC) the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

B) Pesticide Fraction:

The retention times of reported compounds must fall within the calculated retention time windows for the two chromatographic columns and a GC/MS confirmation is required if the concentration exceeds 10ng/ml in the final sample extract.

DC-3: The following pesticide samples have analytes for which the percent difference between column results exceeds primary criteria. Hits > CRQL are flagged "J". Or: if %D is > 50% an value is < CRQL, sample result is elevated to the CRQL and qualified "U". When the percent difference between column results exceeds expanded criteria, and hits > CRQL are flagged "JN" or "R".

B1ZT0DL

Aroclor-1254-J

B1ZT3DL

Aldrin-J, 4,4-DDT-J, alpha-Chlordane-JN

B1ZT5

alpha-Chlordane-JN, gamma-Chlordane-JN

B1ZT6DL

4,4-DDT-J, Aroclor-1254-J

B1ZT6MS

gamma-BHC (Lindane)-J, Heptachlor-J, Aldrin-J, Dieldrin-J, Endrin-J, 4,4-DDT-J, Aroclor-1254-J

B1ZT6MSD

Heptachlor-J, Aldrin-J, Dieldrin-J, Aroclor-1254-J

B1ZT7

4,4-DDT-J, Aroclor-1254-J

B1ZT7DL

4,4-DDT-J, Aroclor-1254-J

B1ZT8

4,4-DDE-J, 4,4-DDT-J

B1ZT9

4,4-DDT-JN,

B1ZT9DL

4,4-DDT-JN, alpha-Chlordane-JN, gamma-Chlordane-U, Aroclor-1260-J

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B1ZW0
4,4-DDT-J, gamma-Chlordane-JN

B1ZW0DL
4,4-DDT-J, alpha-Chlordane-JN, gamma-Chlordane-JN

B1ZW1
Aroclor-1260-J

B1ZW1DL
4,4-DDE-JN, alpha-Chlordane-J, Aroclor-1260-J

B1ZW2
4,4-DDT-J,

B1ZW2DL
4,4-DDT-JN

B1ZW4
4,4-DDE-J,

B1ZW4DL
Dieldrin-U, alpha-Chlordane-JN

B1ZW6
gamma-Chlordane-JN

B1ZW6DL
alpha-Chlordane-JN, gamma-Chlordane-JN

B1ZW8
4,4-DDE-J,

B1ZW8DL
4,4-DDT-U, alpha-Chlordane-JN

B1ZW9
Dieldrin-J, 4,4-DDT-J, alpha-Chlordane-JN, gamma-Chlordane-JN

9. CONTRACT PROBLEMS NON-COMPLIANCE:
10. FIELD DOCUMENTATION:
11. OTHER PROBLEMS
12. This package contains re-extractions, re-analyses or dilutions. Upon reviewing the QA results, the following Form 1(s) are identified not to be used.

B1ZT0DL, B1ZT1DL, B1ZT3DL, B1ZT4DL, B1ZT6DL, B1ZT7DL, B1ZT9DL, B1ZW0DL,
B1ZW1DL, B1ZW2DL, B1ZW4DL, B1ZW5DL, B1ZW6DL, B1ZW8DL

US EPA Region II
Method: CLP/SOW OLM04.2

STANDARD OPERATING PROCEDURE

Date: March, 2001
SOP HW-6, Rev. 12

YES NO N/A

PACKAGE COMPLETENESS AND DELIVERABLES

CASE NUMBER: 34156

LABORATORY: A4

SITE NAME: Matteo & Son Inc.

SDG Number(s): BIZTO

1.0 Chain of Custody and Sampling Trip Reports

- 1.1 Are the Traffic Reports/Chain-of-Custody Records present for all samples? ☒

ACTION: If no, contact RSCC, or contact the TOPO to obtain replacement of missing or illegible copies from the lab.

- 1.2 Is the Sampling Trip Report present for all samples and all fractions? ☒

ACTION: If no, contact either RSCC or ask the TOPO to obtain this information from the prime contractor.

2.0 Data Completeness and Deliverables

- 2.1 Have any missing deliverables been received and added to the data package? ☒

NOTE: The lab is required to submit data for only two analyses, for each fraction. (i.e., the original sample and one dilution, or the most concentrated dilution analyzed and one further dilution.)

ACTION: Contact the TOPO to obtain an explanation or resubmittal of any missing deliverables from the lab. If lab cannot provide them, note the effect on the review of the package in the Contract Problems/Non-compliance section of the Data Assessment.

- 2.2 Was CLASS CCS checklist included with package? ☒

YES NO N/A

- 2.3 Are there any discrepancies between the Traffic Reports/Chain-of-Custody Records, Sampling Report and Sample Tags? 10

ACTION: If yes, contact the TOPO to obtain an explanation or resubmittal of any missing deliverables from the laboratory.

3.0 Cover Letter SDG Narrative

- 3.1 Is the Narrative or Cover Letter Present? 14

- 3.2 Are case number, SDG number and contract number contained in the SDG Narrative or cover letter (see SOW, Exhibit B, section 2.6.1)?
EPA sample numbers in the SDG, detailed documentation of any quality control, sample, shipment, and/or analytical problems encountered in processing the samples? Corrective action taken? 14

- 3.3 Does the narrative contain the following information:

VOA: description of trap and columns used for sample analyses? 11 ✓

VOA: a NOTE stating whether Volatile low level soil samples prepared according to the modified SW-846 Method 5035? (p. B-9/VOA, sec 2.6.1) 11 ✓

VOA: any discrepancies between low level soil weights determined in the field and in the Laboratory? (p. B-10/VOA, sec. 2.6.1) 11 ✓

BNA: description of columns used for sample analyses? 11 ✓

Pest: description of columns used for sample analyses? 14 ✓

NOTE: As per section 6.23.3.1 SOW/p. D-11/Pest,

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YES NO N/A

Packed columns are not permitted.

- 3.4 Does the narrative, VOA and BNA sections, contain a list of all TIC's identified as alkanes and their estimated concentrations? ☐ ☐ ☒
- 3.5 Is the temperature indicator bottle present in the cooler? If not, did the Laboratory document in the SDG Narrative the alternative technique used to determine the cooler temperature? (Exhibit A/ p. A-5 sec. 4.2.1.2.3.3) ☒ ☐ ☐
- 3.6 Does the narrative contain a record of all cooler temperatures? If the temperature of a cooler was exceeded, > 10° C, the lab must list by fraction and sample number, all affected samples. ☒ ☐ ☐
- 3.7 Does the Narrative contain a list of sample reanalyses submitted? Did the Lab distinguish whether the reanalysis is billable, and if so why? ☐ ☐ ☒
- 3.8 Does the narrative contain a list of the pH values determined for each water sample submitted for volatile analysis (SOW Exhibit B, section 2.6.1.2)? ☐ ☐ ☒
- 3.9 Does the Case Narrative contain the statement, "verbatim", as required in Section B of the SOW? ☒ ☐ ☐

ACTION: If "No", to any question in this section, contact the TOPO to obtain all necessary resubmittals. If information is not available, document in the Data Assessment under Contract Problems/Non-Compliance section.

4.0 Data Validation Checklist

- 4.1 Check the package for the following discrepancies:
- a. Is the package paginated in ascending order starting from the SDG narrative? ☒ ☐ ☐

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YES NO N/A

b. Are all forms and copies legible?

☒ YES ☐ NO ☐ N/A

c. Is each fraction assembled in the order set forth in the SOW?

☒ YES ☐ NO ☐ N/A

The following checklist is divided into three parts. Part A is for any VOA analyses, Part B is for BNA's and Part C is Pesticide/PCB's.

Does this package contain:

VOA Data?

☐ YES ☒ NO ☐ N/A

BNA Data?

☐ YES ☒ NO ☐ N/A

Pesticide/PCB data?

☒ YES ☐ NO ☐ N/A

ACTION: Complete corresponding parts of checklist.

STANDARD OPERATING PROCEDURE

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Method: CLP/SOW OLM04.2

Date: March, 2001
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YES NO N/A

PART C: PESTICIDE/PCB ANALYSIS1.0 Sample Conditions/Problems

- 1.1 Do the Traffic Reports/Chain-of-Custody Records or SDG Narrative indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50% - 90% water, all data should be qualified as estimated "J". If a soil sample, other than TCLP, contains more than 90% water, qualify positive results "J" and non-detects "R".

ACTION: If samples were not iced, or if the ice was melted upon arrival at the laboratory, and the temperature of the cooler was elevated $> 10^{\circ}\text{C}$, flag all positive results "J" and all non-detects "UJ".

ACTION: Check aqueous extraction log for sample pH, if adjustment was needed, it should have been noted in the SDG Narrative. If more information is needed, notify the TOPO to contact the lab.

2.0 Holding Times

- 2.1 Have any PEST/PCB technical holding times, determined from date of collection to date of extraction, been exceeded?

NOTE: Technical Holding Times: Water and soil samples for PEST/PCB analysis must be extracted within 7 days of the date of collection. Extracts must be analyzed within 40 days of the date extraction.

ACTION: If technical holding times are exceeded, flag all positive results as estimated "J" and sample quantitation limits "UJ" and document in the

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YES NO N/A

narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all the data should at least be qualified "J", but the reviewer may determine that non-detects are unusable "R".

Table of Holding Time Violations
(See Chain-of-Custody Records)

Sample Analyzed	Sample Matrix	Date Sampled	Date Lab Received	Date Extracted	Date Analyzed
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

NOTE: Contractual Holding Times: Extraction of water samples must be completed within 5 days VTSR. Soil/sediment samples must be extracted within 10 days of VTSR. This requirement does not apply to Performance Evaluation (PE) samples. Extracts of water and soil/sediment samples must be analyzed within 40 days following start of extraction.

ACTION: If contractual holding times are exceeded, document in the Data Assessment.

NOTE: The data reviewer must note in the Data Assessment whether or not technical and contractual holding times were met.

3.0 Surrogate Recovery (Form II)

3.1 Are the PEST/PCB Surrogate Recovery Summaries

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YES NO N/A

(Form II) present for each of the following matrices:

a. Low Water?

☐ ☒ ☒

b. Soil?

☒ ☐ ☐

3.2 Are all the PEST/PCB samples listed on the appropriate Surrogate Recovery Summary for each of the following matrices:

a. Low Water?

☐ ☒ ☒

b. Soil?

☒ ☐ ☐

ACTION: Contact the TOPO to obtain an explanation or resubmittal of any missing deliverables from the laboratory. If missing deliverables are unavailable, document the effect in the Data Assessment.

3.3 Were outliers marked correctly with an asterisk?

☒ ☐ ☐ACTION: Circle all outliers with red pencil.

3.4 Were surrogate recoveries of TCX or DCB outside of the contract specification for any sample, method blank or sulfur clean-up blank (30-150%)?

☒ ☐ ☐ACTION: In the absence of matrix interference, qualification of the data is not required in the following three situations:

1. When surrogates on both columns are diluted out.
2. When one surrogate on one column was outside (either above or below) the contract limits but above 10%.
3. When the same surrogate on both columns is above the contract limit.

ACTION: If the same surrogate on both columns is below the contract limit but above 10%, check

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YES NO N/A

chromatograms for interference. The reviewer may use professional judgement, and qualify only those analytes which elute in the region of the GC chromatogram where interference was observed.

ACTION: If the same surrogate on both columns is below the contract limit but above 10% (with no interference), qualify non-detects and positive hits "J" (estimated).

ACTION: If recoveries for both surrogates on both columns are below the contract limit but above 10%, flag positive results and non-detects for that sample "J".

ACTION: If recoveries are above the contract limit for both surrogates on both columns, then qualify positive values "J".

ACTION: If both surrogates on one column are below the contract limit but above 10%, then use the data from the other column, providing both surrogates on that column are within contract limits. The validator must check from which column the concentration is reported for each analyte. If the value is reported from the failed column, then cross it out and use the value from the other column. Document this change in the Data Assessment.

ACTION: If recovery is below 10% for either surrogate on any column, qualify positive results "J" and flag non-detects "R".

3.5 Were surrogate retention times (RT) within the windows established during the initial 3-point analysis of Individual Standard Mixture A (see Form VI Pest-1)?

ACTION: If the RT limits are not met, positive results and non-detects for that sample may be qualified unusable, "R", based on professional judgement.

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YES NO N/A

- 3.6 Are there any transcription/calculation errors between raw data and Form II? *AS PER CADRE AND CCS*

☒

ACTION: If large errors exist, contact the TOPO to obtain an explanation or resubmittal of corrected deliverables from the laboratory. Make any necessary corrections and document the effect in the Data Assessment.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present?
- 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices (one MS/MSD must be performed for every 20 samples of similar matrix or concentration level):

a. Low Water?

b. Soil?

☒☒☒

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

ACTION: Circle all outliers with red pencil.

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

- 5.1 Is the Method Blank Summary (Form IV) present?
- 5.2 Frequency of Analysis: Has a reagent/method blank been analyzed for each SDG, every 20 samples of similar matrix and concentration level or each extraction batch, whichever is more frequent?

☒

YES NO N/A

ACTION: If any blank data are missing, take action as specified above in section 3.2. If blank data is not available, reject "R" all associated positive data. However, using professional judgement, the data reviewer may substitute field blank data for missing method blank data.

- 5.3 A separate Form IV should be present if part of an extraction batch required sulfur removal. In such cases some samples will be listed on two blank summary forms - once under the method blank, and once under the sulfur clean-up blank (PCBLK). Was this additional blank raw data and Form IV submitted when required?

☒ ☐ ☐

ACTION: If sulfur clean-up blank data and Form IV are missing, take action as specified in 3.2 above.

- 5.4 Has a PEST/PCB instrument blank been analyzed at the beginning of every 12 hr. period following the initial calibration sequence (minimum contract requirement)?

☒ ☐ ☐

ACTION: If any blank data are missing, take action as specified in section 3.2 above.

- 5.5 Was the correct identification scheme used for all Pest/PCB blanks? (See page B-30, sec. 3.3.7.3 of the SOW for further information.)

☒ ☐ ☐

ACTION: Contact the TOPO to obtain resubmittals or make the required corrections on the forms. Document in the Data Assessment under Contract Problems/Non-Compliance all corrections made by the validator.

- 5.6 Chromatography: review the blank raw data - chromatograms, quant. reports and data system printouts. Is the chromatographic performance (baseline stability) for each instrument acceptable?

☒ ☐ ☐

ACTION: Use professional judgement to determine the

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YES NO N/A

effect on the data.

6.0 Contamination

NOTE: "Water blanks", "distilled water blanks" and "drilling water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

6.1 Do any method/reagent, instrument, or cleanup blanks show positive hits for pest/PCBs?

6.2 If any method blanks and/or sulfur clean-up blanks contain "hits" for target compounds, are these hits greater than the CRQL for that analyte?

6.3 In any instrument blanks, is the concentration of any target hit > 0.5 times CRQL for that analyte (see SOW, section 12.1.4.3.3, page D-73/PEST)?

NOTE: Most labs will report 0.5 times CRQLs on the instrument blank Form I instead of the actual method CRQLs. If the lab reported the actual CRQLs, then check if any detected hits are above 0.5 times the CRQLs reported on the Form I.

ACTION: If yes to any of the above questions: note in the Data Assessment under Contract Problems/Non-Compliance if any method or clean-up blanks contain hits > the CRQL, or of instrument blank contained hits > 0.5 times CRQL for that analyte.

6.4 Do any field/rinse blanks have positive pest/PCB results?

ACTION: Prepare a list of the samples associated with each contaminated blank. (Attach a separate sheet)

NOTE: All field blank results associated to a particular group of samples (may exceed one per case or one per day) may be used to qualify data. Do not convert

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YES NO N/A

field blank results to account for the difference in soil CRQLs. Blanks may not be qualified because of contamination in another blank. Field blanks must be qualified for surrogate, and/or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks.

NOTE: When applied as directed in the table below, the contaminant concentration in method/instrument/reagent/cleanup blanks is multiplied by the sample dilution factor, where necessary.

If the laboratory has not already done so, the contaminant concentration in soil blanks is multiplied by 33 times the sample dilution factor and corrected for %moisture (fraction of solid) where necessary. 30 grams of sodium sulfate are used to prepare each soil reagent/method blank as instructed on page D-69/PEST, section 12.1.2.3.1. Ask the TOPO to contact the laboratory if the soil blanks are not reported in soil units ($\mu\text{g/kg}$).

Flag sample result with a "U":	Report CRQL & qualify "U":	No qualification is needed:
Sample conc. > CRQL, but $\leq 5 \times$ blank.	Sample conc. < CRQL & is $\leq 5 \times$ blank value.	Sample conc. > CRQL & > $5 \times$ blank value.

NOTE: If gross blank contamination exists, all data in the associated samples should be qualified as "R", unusable.

6.5 Are there field/rinse/equipment blanks associated with every sample? 11 ☒

ACTION: For low level samples, note in the Data Assessment that there is no associated field/rinse/equipment blank. For analytes with high concentrations, use professional judgement

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YES NO N/A

to qualify these values and document in the Data Assessment.

Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 Calibration and GC Performance

7.1 Are the following Gas Chromatograms and Data Systems Printouts for both columns present for all samples, blanks and MS/MSD:

AS PER CADRE
AND
REPORT

- a. Peak resolution check?
- b. Performance evaluation mixtures?
- c. Aroclor 1016/1260?
- d. Aroclors 1221, 1232, 1242, 1248, 1254?
- e. Toxaphene?
- f. Low points individual mixtures A & B?
- g. Med points individual mixtures A & B?
- h. High points individual mixtures A & B?
- i. Instrument blanks?
- j. Were the appropriate GC columns used as specified on pg. D-10/PEST, sections 6.23.3 to 6.23.3.7, in the SOW?

[X] [X] [X] [X] [X] [X] [X] [X] [X] [X]

7.2 Do the chromatograms for all Individual Standard Mixtures and PEM analyses display single component analytes at > 10% but < 100% of full scale (see sections 9.3.5.8.1 thru 9.3.5.8.4, pages D-30 & 31/PEST)?

[X] [X] [X]

Have chromatograms for Individual Standard Mixtures and PEM analyses been replotted, showing scaling factor(s), to meet the above requirements when necessary?

[X] [X] [X]

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YES NO N/A

NOTE: All standard chromatograms must clearly display all peaks at > 10% but < 100% of full scale, and replotted if necessary to accommodate peaks not properly scaled in the initial chromatogram(s). Both the initial and replotted chromatograms must be submitted with the data package.

ACTION: If all single component peaks are not clearly displayed on chromatograms for all Individual Standard Mixtures and PEM analyses, notify the TOPO to obtain resubmittal of the necessary data.

7.3 Are Forms VI PEST 1-7 present and complete for each column and each analytical sequence?

☒ ☐ ☐

ACTION: If no, take action as specified in 3.2 above.

7.4 Are there any transcription/ calculation errors between raw data and Forms VI? *AS PER CAPRE AND CLS*

☐ ☒ ☐

ACTION: If large errors exist, take action as specified in section 3.2 above.

7.5 Do all standard retention times, including each pesticide in each level of Individual Mixtures A & B, fall within the windows established during the Initial Calibration (see Form VI PEST-1)?
AS PER CAPRE AND CLS

☒ ☐ ☐

ACTION: If no, all samples in the entire analytical sequence are potentially affected. Check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results "JN" and non-detects as unusable (R). For Aroclors, the RT may be outside the window, but the Aroclor may still be identified from its distinctive pattern.

7.6 Are the linearity criteria for the initial

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YES NO N/A

analyses of Individual Standards A & B within limits for both columns? (%RSD must be ≤ 25.0 for alpha and delta BHC, ≤ 30.0 for the two surrogates and $\leq 20\%$ for all other analytes.)

[] ☒ ☐

NOTE: Contractual requirements allow up to two single component TCL compounds, but not surrogates, on each column to exceed the criteria provided the %RSD is $\leq 30\%$. (See page D-26/Pest, sec. 9.2.5.7 in the SOW.) Technical criteria, however, are the same for all analytes.

ACTION: If technical criteria were not met, qualify all associated positive results generated during the entire analytical sequence "J" and all non-detects "UJ". When %RSD $> 90\%$, flag all non-detect results for that analyte "R" (unusable), and positive results as "J" estimated.

ACTION: If more than two analytes failed %RSD, document in the Data Assessment Contract Problems/Non-Compliance section.

7.7 Is the resolution between each pair of adjacent peaks in the Resolution Check Mixture $\geq 60.0\%$ for both columns? (See Form VI PEST-4.) (D-25/Pest)

[] ☒ ☐

ACTION: If no, qualify positive results for compounds that were not adequately resolved "J". Use professional judgement to determine if non-detects which elute in areas affected by co-eluting peaks should be qualified "N" as presumptive evidence of presence or unusable (R).

7.8 Is Form VI PEST-5 present and complete for each Performance Evaluation Mixture (PEM) standard used for both initial and continuing calibrations (see SOW section 3.12.4.4, page B-48)?

[] ☒ ☐

ACTION: If no, take action as specified in section 3.2 above.

7.9 For each PEM standard, was the resolution between

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YES NO N/A

each pair of adjacent peaks $\geq 90.0\%$ on both columns?

☒ ☐ ☐

ACTION: Qualify positive results for compounds not adequately resolved estimated (J). Qualify non-detects based on professional judgement.

7.10 Have Forms VI PEST-6 & PEST-7 been completed for all midpoint Individual Standards A and B used for initial calibration?

☒ ☐ ☐

For each standard, was the resolution between each pair of adjacent peaks $\geq 90.0\%$ on both columns?

☒ ☐ ☐

ACTION: If no, qualify positive results for compounds that were not adequately resolved estimated (J). Use professional judgement to determine if non-detects which elute in areas affected by co-eluting peaks should be qualified "N" as presumptive evidence of presence or unusable "R".

7.11 Is Form VII Pest-1 present and complete for each PEM standard analyzed during the analytical sequence for both columns?

☒ ☐ ☐

NOTE: If a PEM or Individual std mixture does not meet technical criteria listed on sec. 9.3.5.8.1 through 9.3.5.8.4, it MUST be reinjected immediately. If the second injection meets the criteria, sample analysis may continue. Otherwise, ALL data collection MUST BE STOPPED. Document it in the Data Assessment under Contract Problems/Non compliance. (p. D-31/Pest, sec. 9.3.6.4).

Was the %Breakdown of DDT and Endrin calculated using the equations given on page D-24/PEST, sec. 9.2.4.8 in the SOW? *AS PER CADRE AND CCL*

☒ ☐ ☐

Were all pesticides and surrogates in each PEM standard within the RT windows established during the Initial Calibration? *AS PER CADRE AND CCL*

☒ ☐ ☐

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YES NO N/A

ACTION: If no, take action as specified in 3.2 above.

7.12 Has the individual percent breakdown for DDT/Endrin exceeded 20.0% in any PEM on either column? (See Form VII PEST-1.)

- for 4,4'-DDT?

- for Endrin?

Has the combined percent breakdown for DDT/Endrin exceeded 30.0% in any PEM on either column (required for all PEM analyses)?

ACTION: 1. If any percent breakdown has failed the QC criteria in either PEM in steps 2 and 17 in the initial calibration sequence (page D-21/Pest, sec. 9.2.3.4 in the SOW), qualify all samples in the entire analytical sequence as described in sections 2.a, b and c below.

2. If any percent breakdown failed the QC criteria in a PEM calibration verification analysis, review data beginning with the samples which followed the last in-control standard until the next acceptable PEM and qualify the data as described below.

a. 4,4'-DDT Breakdown: If DDT breakdown was > 20.0%:

i. Qualify all positive results for DDT with "J". If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT unusable, "R".

ii. Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity "JN".

b. Endrin Breakdown: If endrin breakdown was > 20.0%:

i. Qualify all positive results for endrin

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YES NO N/A

with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for Endrin as unusable "R".

ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity "JN".

c. Combined Breakdown: If the combined 4,4'-DDT and endrin breakdown is greater than 30.0%:

I. Qualify all positive results for DDT and Endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable "R". If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable "R".

ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity "JN". Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity "JN".

7.13 Are all percent difference (%D) values for PEM analytes and surrogates on both columns $\geq -25\%$ and $\leq +25.0\%$? (See Form VII PEST-1.)

14 _____

ACTION: If no, qualify all associated positive results generated during the analytical sequence "J" and sample quantitation limits "UJ".

NOTE: If the failing PEM is part of the initial calibration, all samples are potentially affected. If the offending standard is a calibration verification, the associated samples are those which followed the last in-control standard until the next passing standard.

7.14 Is Form VII Pest-2 present and complete for each

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YES NO N/A

INDA and INDB calibration verification analyzed? ☒ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

7.15 Are there any transcription/calculation errors between raw data and Form VII Pest-2?

AS PER CAPRE AND CLS

ACTION: If large errors exists, take action as specified in section 3.6 above.

7.16 Do all standard retention times for each INDA and INDB calibration verification fall within the RT windows established during the initial calibration sequence? (See Form VII PEST-2.) ☒ ☐ ☐ACTION: If no, beginning with the samples which followed the last in-control standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R).7.17 Are all %D values for INDA and INDB calibration verification compounds $\geq -25.0\%$ and $\leq +25.0\%$? ☒ ☐ ☐ACTION: If the %D is outside the $\pm 25.0\%$ range for any compound(s), qualify associated positive results for that compound "J" and non-detects "UJ". The "associated samples" are those which followed the last in-control standard up to the next passing standard containing the analyte(s) in question. If the %D is $> 90\%$, flag all non-detects for that analyte "R" (unusable).8.0 Analytical Sequence Check (Form VIII-PEST)8.1 Is Form VIII present and complete for each column and each period of analyses? ☒ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

YES NO N/A

- 8.2 Was the proper analytical sequence followed for each initial calibration and subsequent analyses, and all standards analyzed at the required frequency for each GC/ECD instrument used.? (See SOW pages D-21 & D-55/PEST.)

☒ YES ☐ NO ☐ N/A

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify accordingly. Generally, the effect is negligible unless the sequence was grossly altered and/or the calibration was out of QC limits.

- 8.3 Were all samples analyzed within a 12 hour time period beginning with the injection of an instrument blank and bracketed by acceptable analyses of the proper standards?

☒ YES ☐ NO ☐ N/A

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify accordingly. Document in the Data Assessment under Contract Problems/Non-Compliance.

- 8.4 If a multi-component analyte was detected in a sample, was a matching multi-component standard analyzed within 72 hours of the injection of the sample and within a valid 12 hour sequence?

6/30 ☒ YES ☐ NO ☐ N/A

NOTE: This additional standard is for identification purposes only. Positive results for Aroclors and Toxaphene are quantitated from the initial calibration.

ACTION: If no, document in the Data Assessment under Contract Problems/Non-Compliance.

9.0 Cleanup Efficiency Verification (Form IX)

- 9.1 Is Form IX PEST-1 present and complete for each lot of Florisil Cartridges used? (Florisil Cleanup is required for all Pest/PCB extracts.)

☒ YES ☐ NO ☐ N/A

Are all samples listed on the Pesticide Florisil

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YES NO N/A

Cartridge Check Form?

☒ YES

ACTION: If no, take action specified in 3.2 above. If data suggests florasil clean-up was not performed, document in the Data Assessment under the Contract Non-compliance section.

- 9.2 Are percent recoveries (%REC) of the pesticide and surrogate compounds used to check the efficiency of the florasil clean-up procedure within QC limits of 80 - 120%?

☒ YES

ACTION: Qualify only the analyte(s) which failed the recovery criteria as follows:

If %REC is < 80%, qualify positive results "J" and non-detects "UJ".

If any pesticide %REC was zero, flag non-detects "R" for that compound.

Use professional judgement to qualify positive results if any recoveries are > 120%.

NOTE: Sample data should be evaluated for potential interferences if recovery of 2,4,5-trichlorophenol was > 5% in the Florasil Cartridge Performance Check analysis. Document any problems found in the Data Assessment under the Contract Problems/Non-Compliance section.

- 9.3 If GPC Cleanup was performed (mandatory for all soil sample extracts), is Form IX Pest-2 present?
As per CAPRE AND CCS.
- Are all soil samples listed on Form IX Pest-2?

☒ YES☒ YES

ACTION: If no, take action specified in 3.2 above. If data suggests GPC clean-up was not performed when required, document in the Data Assessment under the Contract Problems/Non-Compliance section.

Are the %REC values for all pesticides in the GPC

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YES NO N/A

calibration solution between 80 - 110%?

Y

ACTION: Qualify only those analytes which failed the recovery criteria as follows:

If %REC are < 80%, qualify positive results "J" and non-detects "UJ".

If any pesticide %REC was zero, flag non-detects "R" for that compound.

Use professional judgement to qualify positive results if any recoveries are > 110%.

NOTE: An Aroclor mixture containing Aroclors 1016 and 1260 is also analyzed during GPC calibration; however, Aroclor data is not listed on Form IX PEST-2. The raw GPC data for Aroclors 1016/1260 must be evaluated for pattern similarity with previously analyzed Aroclor standards.

- 9.4 The validator should verify that the correct identification scheme for the EPA Blank samples were used. See page B-30, sec. 3.3.7.2 and 3.3.7.9 of the SOW for further information.

Was the correct identification scheme used for GPC and Florisil blanks?

Y

10.0 Pesticide/PCB Identification

- 10.1 Is Form X complete for every sample in which a pesticide or PCB was detected?

Y

ACTION: If no, take action specified in 3.2 above.

- 10.2 Are all sample chromatograms properly scaled, attenuated, etc. as required for proper identification of single and multi-component analytes? (Refer to SOW sections 11.3.7.1 thru 11.3.7.8, page D-67/Pest for specific details.)

Y

NOTE: Proper verification of Pest/PCB results depends

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YES NO N/A

on clear, legible presentation of the raw data. Single component pesticides and all peaks chosen for quantitation of multi-component analytes must appear at less than full scale. Toxaphene and PCB patterns must be clearly visible to enable comparison with standard chromatograms.

ACTION: If retention times or apex of peaks cannot be verified, or if multi-component peak patterns cannot be discerned, contact the TOPO to obtain rescaled chromatograms from the lab.

- 10.3 Are there any transcription/calculation errors between raw data and Forms 10A and 10B?

AS PER CAORE AND CES

ACTION: If large errors exist, take action as specified in section 3.2 above.

- 10.4 Are RTs of sample compounds within the established RT windows for analyses on both columns? *AS PER CAORE AND CES*

Was GC/MS confirmation provided when required (when compound concentration is > 10 ug/ml in the final extract)? *AS PER CAORE AND CES*

ACTION: Use professional judgement to qualify positive results which were not confirmed by GC/MS analysis. Qualify as unusable (R) all positive results which were not confirmed on a second GC column. Also qualify as unusable (R) all positive results which do not meet RT window criteria, unless associated standard compounds are similarly biased. Use professional judgement to assign an appropriate quantitation limit.

- 10.5 Is the percent difference (%D) calculated for the positive sample results on both columns > 25.0%?

ACTION: If the reviewer finds neither column shows interference for the positive hits, the Pesticide data should be flagged as follows:

STANDARD OPERATING PROCEDURE

US EPA Region II

Date: March, 2001

Method: CLP/SOW OLM04.2

SOP HW-6, Rev. 11

YES NO N/A

<u>% Difference</u>	<u>Qualifier</u>
0 - 25%	None
26 - 70%	"J"
71 - 100%	"JN"
100 - 200% (No Interference)	"R"
<u>100 - 200% (Interference detected)*</u>	"JN"
> 50% (Pesticide value is < CRQL)**	"U"
> 200%	"R"
* When the reported %D is <u>100- 200%</u> , but interference is detected on either column, qualify the data with <u>"JN"</u> .	

** When the reported pesticide value is lower than the CRQL, and the %D is > 50%, raise the value to the CRQL and qualify "U", undetected.

NOTE: For Aroclors, if the %D is > 50%, but the pattern of GC peaks on both columns indicates a specific Aroclor is present, qualify that Aroclor "J".

NOTE: The lower of the two values is reported on Form I. If using professional judgement, the reviewer determines that the higher result was more acceptable, the reviewer should replace the value and indicate the reason for the change in the Data Assessment.

10.6 Check chromatograms for false negatives, especially the multiple-peak compounds (Toxaphene and the PCBs). Were there any false negatives? 11

ACTION: Use professional judgement to decide if the compound should be reported. If the appropriate PCB standards were not analyzed within 72 hrs. of the sample(s) in question, qualify the data unusable "R".

Also note in Data Assessment under Contract Problems/Non-Compliance if the lab failed to analyze Aroclor standards when required.

11.0 Target Compound List (TCL) Analytes

11.1 Are the Organic Analysis Data Sheets (Form I

US EPA Region II

STANDARD OPERATING PROCEDURE

Method: CLP/SOW OLM04.2

Date: March, 200

SOP HW-6, Rev. 12

YES NO N/A

Pest) present with required header information on each page, for each of the following:

- a. Samples and/or fractions as appropriate?
 - b. Matrix spikes and matrix spike duplicates?
 - c. Blanks?
 - d. Instrument Blanks (per column & analysis)?
- 11.2 Are the Pest chromatograms and quant. reports included in the sample data package for each of the following:

- a. Samples and/or fractions as appropriate?
- b. Matrix spikes and matrix spike duplicates?
- c. Blanks?
- d. Instrument Blanks (per column & analysis)?

ACTION: If any data are missing, take action specified in 3.2 above.

- 11.3 Is chromatographic performance acceptable with respect to:

- a. Baseline stability?
- b. Resolution?
- c. Peak shape?
- d. Full-scale graph attenuation?
- e. Other: _____?

- 11.4 Were any electropositive displacement (negative peaks) or unusual peaks seen?

ACTION: Use professional judgement to determine the acceptability of the data. Address comments

STANDARD OPERATING PROCEDURE

US EPA Region II

Date: March, 2001

Method: CLP/SOW OLM04.2

SOP HW-6, Rev. 12

YES NO N/A

under System Performance section of the Data Assessment.

12.0 Compound Quantitation and Reported Detection Limits

- 12.1 Are there any transcription/calculation errors in Form I results? Check at least two positive results. Were any errors found? *AS PER CADRE AND CCS.* 11

NOTE: Single-peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. Use professional judgement to decide whether a large discrepancy indicates the presence of an interfering compound. If an interfering compound is visible on the chromatogram, the lower of the two values should be reported and qualified as presumptively present at an approximated quantity "JN". This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has interfered with the evaluation of the second column confirmation.

- 12.2 Are the CRQLs adjusted to reflect sample dilutions? *AS PER CADRE AND CCS* 11

ACTION: If large errors exist, take action as specified in section 3.2 above.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQLs from the diluted sample). Replace concentrations which exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with the result from the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including those in the data summary package.

ACTION: Quantitation limits affected by large, off-scale

STANDARD OPERATING PROCEDURE

US EPA Region II

Method: CLP/SOW OLM04.2

Date: March, 2001

SOP HW-6, Rev. 12

YES NO N/A

peaks should be qualified as unusable (R). If the interference is on-scale, the reviewer may offer an approximated quantitation limit (UJ) for each affected compound.

NOTE: If a sample required greater than a 10 times dilution, then a 10 times more concentrated analysis must also be performed and submitted (see SOW, page D-57/PEST, section 10.2.3.5).

ACTION: If a more concentrated analysis is unavailable, document in the Contract Problems/Non-Compliance section of the Data Assessment. Use professional judgement to qualify non-detects and positive hits below the CRQL.

13.0 Field Duplicates

13.1 Were any field duplicates submitted?

1 ☒

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

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A4 SCIENTIFIC, INC.

1544 Sawdust Road, Suite 505 • The Woodlands, TX 77380 • Phone (281) 292-5277

MIM2.20034
RECEIVED

JUN 21 2005

Contract #: 68W03027

Case #: 34156

SDG #: B1ZT0

HAZ. WASTE SUPPORT SEC

SDG NARRATIVE**SAMPLE RECEIPT & LOGIN**

The following samples were received on the dates listed against them. The samples were logged in for analysis as listed.

EPA SAMPLE #	LAB SAMPLE #	DATE /TIME RECEIVED	AIRBILL NO.	VOA	BNA	PEST	REMARKS
B1ZT0	6115.001	4/30/05 9:30	851847483114			X	
B1ZT1	6115.002	4/30/05 9:30	851847483114			X	
B1ZT2	6115.003	4/30/05 9:30	851847483114			X	
B1ZT3	6115.004	4/30/05 9:30	851847483114			X	
B1ZT4	6115.005	4/30/05 9:30	851847483114			X	
B1ZT5	6115.006	4/30/05 9:30	851847483114			X	
B1ZT6	6115.007	4/30/05 9:30	851847483114			X	
B1ZT7	6115.008	4/30/05 9:30	851847483114			X	
B1ZT8	6115.009	4/30/05 9:30	851847483114			X	
B1ZT9	6115.010	4/30/05 9:30	851847483114			X	
B1ZW0	6115.011	4/30/05 9:30	851847483114			X	
B1ZW1	6115.012	4/30/05 9:30	851847483114			X	
B1ZW2	6115.013	4/30/05 9:30	851847483114			X	
B1ZW3	6115.014	4/30/05 9:30	851847483114			X	
B1ZW4	6115.015	4/30/05 9:30	851847483114			X	
B1ZW5	6115.016	4/30/05 9:30	851847483114			X	
B1ZW6	6115.017	4/30/05 9:30	851847483114			X	
B1ZW7	6115.018	4/30/05 9:30	851847483114			X	
B1ZW8	6115.019	4/30/05 9:30	851847483114			X	
B1ZW9	6115.020	4/30/05 9:30	851847483114			X	

The cooler temperatures are listed against the coolers.

DATE RECEIVED	COOLER NO.	Temp (in °C)
4/30/05	1	3

No discrepancies or issues were noted during sample receipt and login.

PESTICIDES

Soil samples were extracted using the sonication method on 05/08/2005. No problems were encountered during extraction. GPC cleanup was performed on all soil samples and the associated Blanks, MS, and MSD.

Samples were analyzed using instrument C-6890.

Instrument C-6890 consisted of a dual inlet, dual ECD Agilent 6890 GC/ECD instrument with the following two columns manufactured by Restek. A 1µL injection was used on each column

Column 1 = RTX-PEST: Cat # 11140, 30m long, 0.53mm ID, 0.5µm film thickness (Instrument ID: C-6890A)
Column 2 = RTX-PEST2: Cat # 111340, 30m long, 0.53mm ID, 0.42µm film thickness (instrument ID: C-6890B)

Contract #: 68W03027

Case #: 34156

SDG #: B1ZT0

SDG NARRATIVE

A 1 µL injection was used on each column.

The extracts of the following samples were dark in color and could not be analyzed at 1x. The samples were analyzed at the dilution listed against them:

EPA SAMPLE ID	DILUTION
B1ZT0	2
B1ZT1	100
B1ZT6	5

The extracts of the following samples were dark in color and could not be analyzed at 1x. The samples were analyzed at the dilution listed against them:

EPA SAMPLE ID	DILUTION
B1ZT0	20
B1ZT1	1000
B1ZT3	10
B1ZT4	10
B1ZT6	50
B1ZT7	2
B1ZT9	10
B1ZW0	5
B1ZW1	5
B1ZW2	2
B1ZW4	5
B1ZW5	2
B1ZW6	5
B1ZW8	10

Manual integrations were performed for the following compounds for the samples listed against them.

COMPOUND	EPA SAMPLE ID (Inst=C-6890A)	EPA SAMPLE ID (Inst=C-6890B)
Tetrachloro-m-xylene	B1ZT1, B1ZT2, B1ZT8, B1ZT9, B1ZW7, B1ZW9	B1ZT1, B1ZT2, B1ZT9
Alpha-Chlordane	B1ZT9DL	
Gamma-Chlordane	B1ZT9DL, B1ZW8	
4,4'-DDT	B1ZT9DL, B1ZW8	B1ZT7DL
4,4'-DDE	B1ZT3DL, B1ZW0, B1ZW0DL, B1ZW8, B1ZW8DL	B1ZT3DL, B1ZW0, B1ZW0DL, B1ZW8DL
Aldrin		B1ZT6MS
Dieldrin		B1ZT6MS, B1ZT6MSD
Endrin	B1ZT6MS, B1ZT6MSD	B1ZT6MS, B1ZT6MSD
Decachlorobiphenyl	B1ZT8, B1ZW7	

000000002

A4 SCIENTIFIC, INC.

MIM2.20036

1544 Sawdust Road, Suite 505 • The Woodlands, TX 77380 • Phone (281) 292-5277

Contract #: 68W03027

Case #: 34156

SDG #: B1ZT0

SDG NARRATIVE

These manual integrations were necessary because the software failed to accurately integrate the entire peak. In all the above instances, the quantitation reports are flagged with "m". A hard copy printout of the manual integration, the scan ranges, and initials of the analyst or manager is included in the data package.

The following equations are used for calculation of sample results from raw instrument output data:

$$\text{Concentration } (\mu\text{g/Kg}) = \frac{(A_x)(V_i)(D_f)(GPC)}{(CF)(V_i)(W_s)(D)}$$

A_x = Area of the peak for the compound to be measured.

CF = Calibration factor from the initial calibration for the mid-point concentration external standard (area per ng).

V_i = 5,000 μL

V_i = Volume of extract injected in microliters (μL).

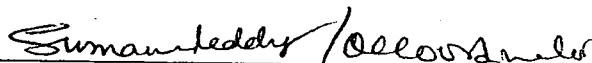
$$D = \frac{100 - \% \text{moisture}}{100}$$

W_s = Weight of sample extracted in grams (g).

D_f = Dilution factor

GPC = GPC factor = 2

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package and in the computer readable data submitted on diskette has been authorized by the laboratory manager or his/her designee, as verified by the following signature:



Signature and Title

6/22/0

Date of Signature

000000003

**Sample Delivery Group(SDG)
Cover Sheet****RECEIVED****JUN 21 2005****HAZ. WASTE SUPPORT SEC.****SDG Number:** B1ZT0**Laboratory Name.:** A4 SCIENTIFIC, INC.**Laboratory Code.:** A4**Contract No.:** 68W03027**Case No.:** 34156**Analysis Price:****SDG Turnaround:** 14 days**EPA Sample Numbers in SDG(Listed in Numerical Order)**

1)B1ZT0	7)B1ZT6	13)B1ZW2	19)B1ZW8
2)B1ZT1	8)B1ZT7	14)B1ZW3	20)B1ZW9
3)B1ZT2	9)B1ZT8	15)B1ZW4	21)
4)B1ZT3	10)B1ZT9	16)B1ZW5	22)
5)B1ZT4	11)B1ZW0	17)B1ZW6	23)
6)B1ZT5	12)B1ZW1	18)B1ZW7	24)

B1ZT0

First Sample in SDG

B1ZW9

Last Sample in SDG

04/30/2005

First Sample Receipt Date

04/30/2005

Last Sample Receipt Date

Note: There are a maximum of 20 samples (excluding PE sample) in SDG. Attach TRs to this form in alphanumeric order(the order listed above on this form).

Signature **Date** 4/30/05

000000004

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT0

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.001

Sample wt/vol: 30.2 (g/mL) G

Lab File ID: _____

% Moisture: 45

Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/08/05

Injection Volume: 1.0 (uL)

Dilution Factor: 2.0

GPC Cleanup: (Y/N) Y

pH: 6.5

Sulfur Cleanup: (Y/N) N

CAS NO. COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	6.1	U
319-85-7	beta-BHC	6.1	U
319-86-8	delta-BHC	6.1	U
58-89-9	gamma-BHC (Lindane)	6.1	U
76-44-8	Heptachlor	6.1	U
309-00-2	Aldrin	6.1	U
1024-57-3	Heptachlor epoxide	6.1	U
959-98-8	Endosulfan I	6.1	U
60-57-1	Dieldrin	12	U
72-55-9	4,4'-DDE	12	U
72-20-8	Endrin	12	U
33213-65-9	Endosulfan II	12	U
72-54-8	4,4'-DDD	12	U
1031-07-8	Endosulfan sulfate	12	U
50-29-3	4,4'-DDT	12	U
72-43-5	Methoxychlor	61	U
53494-70-5	Endrin ketone	12	U
7421-93-4	Endrin aldehyde	12	U
5103-71-9	alpha-Chlordane	6.1	U
5103-74-2	gamma-Chlordane	6.1	U
8001-35-2	Toxaphene	610	U
12674-11-2	Aroclor-1016	120	U
11104-28-2	Aroclor-1221	240	U
11141-16-5	Aroclor-1232	120	U
53469-21-9	Aroclor-1242	120	U
12672-29-6	Aroclor-1248	120	U
11097-69-1	Aroclor-1254	* 3300 2400	U
11096-82-5	Aroclor-1260	120	U

* transferred from dilution

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT1

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.002

Sample wt/vol: 29.9 (g/mL) G

Lab File ID: _____

% Moisture: 15 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/08/05

Injection Volume: 1.0 (uL)

Dilution Factor: 100.0

GPC Cleanup: (Y/N) Y

pH: 6.4

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	200	U
319-85-7	beta-BHC	200	U
319-86-8	delta-BHC	200	U
58-89-9	gamma-BHC (Lindane)	200	U
76-44-8	Heptachlor	200	U
309-00-2	Aldrin	200	U
1024-57-3	Heptachlor epoxide	200	U
959-98-8	Endosulfan I	200	U
60-57-1	Dieldrin	390	U
72-55-9	4,4'-DDE	390	U
72-20-8	Endrin	390	U
33213-65-9	Endosulfan II	390	U
72-54-8	4,4'-DDD	390	U
1031-07-8	Endosulfan sulfate	390	U
50-29-3	4,4'-DDT	390	U
72-43-5	Methoxychlor	2000	U
53494-70-5	Endrin ketone	390	U
7421-93-4	Endrin aldehyde	390	U
5103-71-9	alpha-Chlordane	200	U
5103-74-2	gamma-Chlordane	200	U
8001-35-2	Toxaphene	20000	U
12674-11-2	Aroclor-1016	3900	U
11104-28-2	Aroclor-1221	7900	U
11141-16-5	Aroclor-1232	3900	U
53469-21-9	Aroclor-1242	3900	U
12672-29-6	Aroclor-1248	3900	U
11097-69-1	Aroclor-1254	+ 200000 170000	E
11096-82-5	Aroclor-1260	3900	U

** transferred from dilution*

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT2

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.003

Sample wt/vol: 30.4 (g/mL) G

Lab File ID: _____

% Moisture: 20 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/06/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.3

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	Q
319-84-6	alpha-BHC	2.1 U
319-85-7	beta-BHC	2.1 U
319-86-8	delta-BHC	2.1 U
58-89-9	gamma-BHC (Lindane)	2.1 U
76-44-8	Heptachlor	2.1 U
309-00-2	Aldrin	2.1 U
1024-57-3	Heptachlor epoxide	2.1 U
959-98-8	Endosulfan I	2.1 U
60-57-1	Dieldrin	4.1 U
72-55-9	4,4'-DDE	4.1 U
72-20-8	Endrin	4.1 U
33213-65-9	Endosulfan II	4.1 U
72-54-8	4,4'-DDD	4.1 U
1031-07-8	Endosulfan sulfate	4.1 U
50-29-3	4,4'-DDT	9.1 U
72-43-5	Methoxychlor	21 U
53494-70-5	Endrin ketone	4.1 U
7421-93-4	Endrin aldehyde	4.1 U
5103-71-9	alpha-Chlordane	2.1 U
5103-74-2	gamma-Chlordane	2.1 U
8001-35-2	Toxaphene	210 U
12674-11-2	Aroclor-1016	41 U
11104-28-2	Aroclor-1221	83 U
11141-16-5	Aroclor-1232	41 U
53469-21-9	Aroclor-1242	41 U
12672-29-6	Aroclor-1248	41 U
11097-69-1	Aroclor-1254	41 U
11096-82-5	Aroclor-1260	41 U

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT3

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.004

Sample wt/vol: 29.5 (g/mL) G

Lab File ID: _____

% Moisture: 20 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/06/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.8

Sulfur Cleanup: (Y/N) N

CAS NO. COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Q

319-84-6	alpha-BHC	2.2	U	J
319-85-7	beta-BHC	2.2	U	J
319-86-8	delta-BHC	2.2	U	J
58-89-9	gamma-BHC (Lindane)	2.2	U	Y
76-44-8	Heptachlor	2.2	U	J
309-00-2	Aldrin	15	J	J
1024-57-3	Heptachlor epoxide	2.2	U	J
959-98-8	Endosulfan I	2.2	U	J
60-57-1	Dieldrin	* 280 230	E	J
72-55-9	4,4'-DDE	4.2	U	J
72-20-8	Endrin	4.2	U	J
33213-65-9	Endosulfan II	4.2	U	J
72-54-8	4,4'-DDD	4.2	U	Y
1031-07-8	Endosulfan sulfate	4.2	U	J
50-29-3	4,4'-DDT	* 100 92	E	J
72-43-5	Methoxychlor	22	U	J
53494-70-5	Endrin ketone	4.2	U	J
7421-93-4	Endrin aldehyde	4.2	U	J
5103-71-9	alpha-Chlordane	* 68 65	E	J
5103-74-2	gamma-Chlordane	* 45 44	E	J
8001-35-2	Toxaphene	220	U	J
12674-11-2	Aroclor-1016	42	U	J
11104-28-2	Aroclor-1221	85	U	J
11141-16-5	Aroclor-1232	42	U	J
53469-21-9	Aroclor-1242	42	U	J
12672-29-6	Aroclor-1248	42	U	Y
11097-69-1	Aroclor-1254	42	U	J
11096-82-5	Aroclor-1260	240	J	J

* transferred from dilution

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT4

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.005

Sample wt/vol: 30.2 (g/mL) G

Lab File ID: _____

% Moisture: 25 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/08/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.6

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.3	U
319-85-7	beta-BHC	2.3	U
319-86-8	delta-BHC	2.3	U
58-89-9	gamma-BHC (Lindane)	2.3	U
76-44-8	Heptachlor	2.3	U
309-00-2	Aldrin	2.3	U
1024-57-3	Heptachlor epoxide	2.3	U
959-98-8	Endosulfan I	2.3	U
60-57-1	Dieldrin	4.4	U
72-55-9	4,4'-DDE	4.4	U
72-20-8	Endrin	4.4	U
33213-65-9	Endosulfan II	4.4	U
72-54-8	4,4'-DDD	4.4	U
1031-07-8	Endosulfan sulfate	4.4	U
50-29-3	4,4'-DDT	4.4	U
72-43-5	Methoxychlor	23	U
53494-70-5	Endrin ketone	4.4	U
7421-93-4	Endrin aldehyde	4.4	U
5103-71-9	alpha-Chlordane	2.3	U
5103-74-2	gamma-Chlordane	2.3	U
8001-35-2	Toxaphene	230	U
12674-11-2	Aroclor-1016	44	U
11104-28-2	Aroclor-1221	89	U
11141-16-5	Aroclor-1232	44	U
53469-21-9	Aroclor-1242	44	U
12672-29-6	Aroclor-1248	44	U
11097-69-1	Aroclor-1254	44	U
11096-82-5	Aroclor-1260	44	U

** transferred from dilution*

000000059

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT5

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.006

Sample wt/vol: 30.1 (g/mL) G

Lab File ID: _____

% Moisture: 1 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/15/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.5

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Q

CAS NO.	COMPOUND		
319-84-6	alpha-BHC	1.7	U
319-85-7	beta-BHC	1.7	U
319-86-8	delta-BHC	1.7	U
58-89-9	gamma-BHC (Lindane)	1.7	U
76-44-8	Heptachlor	1.7	U
309-00-2	Aldrin	1.7	U
1024-57-3	Heptachlor epoxide	1.7	U
959-98-8	Endosulfan I	1.7	U
60-57-1	Dieldrin	3.3	U
72-55-9	4,4'-DDE	3.3	U
72-20-8	Endrin	3.3	U
33213-65-9	Endosulfan II	3.3	U
72-54-8	4,4'-DDD	3.3	U
1031-07-8	Endosulfan sulfate	3.3	U
50-29-3	4,4'-DDT	13	U
72-43-5	Methoxychlor	17	U
53494-70-5	Endrin ketone	3.3	U
7421-93-4	Endrin aldehyde	3.3	U
5103-71-9	alpha-Chlordane	9.9	U
5103-74-2	gamma-Chlordane	6.8	U
8001-35-2	Toxaphene	170	U
12674-11-2	Aroclor-1016	33	U
11104-28-2	Aroclor-1221	67	U
11141-16-5	Aroclor-1232	33	U
53469-21-9	Aroclor-1242	33	U
12672-29-6	Aroclor-1248	33	U
11097-69-1	Aroclor-1254	33	U
11096-82-5	Aroclor-1260	52	U

0000000059

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT6

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.007

Sample wt/vol: 29.8 (g/mL) G

Lab File ID: _____

% Moisture: 24

Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/08/05

Injection Volume: 1.0 (uL)

Dilution Factor: 5.0

GPC Cleanup: (Y/N) Y

pH: 6.2

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	11	U
319-85-7	beta-BHC	11	U
319-86-8	delta-BHC	11	U
58-89-9	gamma-BHC (Lindane)	11	U
76-44-8	Heptachlor	11	U
309-00-2	Aldrin	11	U
1024-57-3	Heptachlor epoxide	11	U
959-98-8	Endosulfan I	11	U
60-57-1	Dieldrin	22	U
72-55-9	4,4'-DDE	22	U
72-20-8	Endrin	22	U
33213-65-9	Endosulfan II	22	U
72-54-8	4,4'-DDD	22	U
1031-07-8	Endosulfan sulfate	22	U
50-29-3	4,4'-DDT	22	U
72-43-5	Methoxychlor	110	U
53494-70-5	Endrin ketone	22	U
7421-93-4	Endrin aldehyde	22	U
5103-71-9	alpha-Chlordane	11	U
5103-74-2	gamma-Chlordane	11	U
8001-35-2	Toxaphene	1100	U
12674-11-2	Aroclor-1016	220	U
11104-28-2	Aroclor-1221	440	U
11141-16-5	Aroclor-1232	220	U
53469-21-9	Aroclor-1242	220	U
12672-29-6	Aroclor-1248	220	U
11097-69-1	Aroclor-1254	220	U
11096-82-5	Aroclor-1260	220	U

** transferred from dilution*

000000074

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT7

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.008

Sample wt/vol: 29.6 (g/mL) G

Lab File ID: _____

% Moisture: 17 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/08/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.7

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/KG

Q

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.1	U
319-85-7	beta-BHC	2.1	U
319-86-8	delta-BHC	2.1	U
58-89-9	gamma-BHC (Lindane)	2.1	U
76-44-8	Heptachlor	2.1	U
309-00-2	Aldrin	2.1	U
1024-57-3	Heptachlor epoxide	2.1	U
959-98-8	Endosulfan I	2.1	U
60-57-1	Dieldrin	4.0	U
72-55-9	4,4'-DDE	4.0	U
72-20-8	Endrin	4.0	U
33213-65-9	Endosulfan II	4.0	U
72-54-8	4,4'-DDD	4.0	U
1031-07-8	Endosulfan sulfate	4.0	U
50-29-3	4,4'-DDT	64	U
72-43-5	Methoxychlor	21	U
53494-70-5	Endrin ketone	4.0	U
7421-93-4	Endrin aldehyde	4.0	U
5103-71-9	alpha-Chlordane	2.1	U
5103-74-2	gamma-Chlordane	2.1	U
8001-35-2	Toxaphene	210	U
12674-11-2	Aroclor-1016	40	U
11104-28-2	Aroclor-1221	82	U
11141-16-5	Aroclor-1232	40	U
53469-21-9	Aroclor-1242	40	U
12672-29-6	Aroclor-1248	40	U
11097-69-1	Aroclor-1254	380	U
11096-82-5	Aroclor-1260	40	U

000000084

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT8

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.009

Sample wt/vol: 30.3 (g/mL) G

Lab File ID: _____

% Moisture: 8

Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/06/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.3

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)UG/KG	Q
319-84-6	alpha-BHC	1.8	U
319-85-7	beta-BHC	1.8	U
319-86-8	delta-BHC	1.8	U
58-89-9	gamma-BHC (Lindane)	1.8	U
76-44-8	Heptachlor	1.8	U
309-00-2	Aldrin	1.8	U
1024-57-3	Heptachlor epoxide	1.8	U
959-98-8	Endosulfan I	1.8	U
60-57-1	Dieldrin	3.6	U
72-55-9	4,4'-DDE	9.2	U
72-20-8	Endrin	3.6	U
33213-65-9	Endosulfan II	3.6	U
72-54-8	4,4'-DDD	3.6	U
1031-07-8	Endosulfan sulfate	3.6	U
50-29-3	4,4'-DDT	23	U
72-43-5	Methoxychlor	18	U
53494-70-5	Endrin ketone	3.6	U
7421-93-4	Endrin aldehyde	3.6	U
5103-71-9	alpha-Chlordane	1.8	U
5103-74-2	gamma-Chlordane	1.8	U
8001-35-2	Toxaphene	180	U
12674-11-2	Aroclor-1016	36	U
11104-28-2	Aroclor-1221	72	U
11141-16-5	Aroclor-1232	36	U
53469-21-9	Aroclor-1242	36	U
12672-29-6	Aroclor-1248	36	U
11097-69-1	Aroclor-1254	36	U
11096-82-5	Aroclor-1260	36	U

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZT9

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.010

Sample wt/vol: 29.8 (g/mL) G

Lab File ID: _____

% Moisture: 10 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/06/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.5

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	Q
319-84-6	alpha-BHC	1.9 U
319-85-7	beta-BHC	1.9 U
319-86-8	delta-BHC	1.9 U
58-89-9	gamma-BHC (Lindane)	1.9 U
76-44-8	Heptachlor	1.9 U
309-00-2	Aldrin	1.9 U
1024-57-3	Heptachlor epoxide	1.9 U
959-98-8	Endosulfan I	1.9 U
60-57-1	Dieldrin	1.9 U
72-55-9	4,4'-DDE	3.7 U
72-20-8	Endrin	3.7 U
33213-65-9	Endosulfan II	3.7 U
72-54-8	4,4'-DDD	3.7 U
1031-07-8	Endosulfan sulfate	3.7 U
50-29-3	4,4'-DDT	20 U
72-43-5	Methoxychlor	19 U
53494-70-5	Endrin ketone	3.7 U
7421-93-4	Endrin aldehyde	3.7 U
5103-71-9	alpha-Chlordane	28 U
5103-74-2	gamma-Chlordane	28 U
8001-35-2	Toxaphene	190 U
12674-11-2	Aroclor-1016	37 U
11104-28-2	Aroclor-1221	75 U
11141-16-5	Aroclor-1232	37 U
53469-21-9	Aroclor-1242	37 U
12672-29-6	Aroclor-1248	37 U
11097-69-1	Aroclor-1254	37 U
11096-82-5	Aroclor-1260	120 U

** transferred from dilution*

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW0

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.011

Sample wt/vol: 30.2 (g/mL) G

Lab File ID: _____

% Moisture: 15 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/09/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.3

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.0	U
319-85-7	beta-BHC	2.0	U
319-86-8	delta-BHC	2.0	U
58-89-9	gamma-BHC (Lindane)	2.0	U
76-44-8	Heptachlor	2.0	U
309-00-2	Aldrin	2.0	U
1024-57-3	Heptachlor epoxide	2.0	U
959-98-8	Endosulfan I	2.0	U
60-57-1	Dieldrin	3.9	U
72-55-9	4,4'-DDE	7.0	U
72-20-8	Endrin	3.9	U
33213-65-9	Endosulfan II	3.9	U
72-54-8	4,4'-DDD	3.9	U
1031-07-8	Endosulfan sulfate	3.9	U
50-29-3	4,4'-DDT	29	U
72-43-5	Methoxychlor	20	U
53494-70-5	Endrin ketone	3.9	U
7421-93-4	Endrin aldehyde	3.9	U
5103-71-9	alpha-Chlordane	50	U
5103-74-2	gamma-Chlordane	21	U
8001-35-2	Toxaphene	200	U
12674-11-2	Aroclor-1016	39	U
11104-28-2	Aroclor-1221	78	U
11141-16-5	Aroclor-1232	39	U
53469-21-9	Aroclor-1242	39	U
12672-29-6	Aroclor-1248	39	U
11097-69-1	Aroclor-1254	39	U
11096-82-5	Aroclor-1260	150	U

** transferred from dilution*

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW1

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.012

Sample wt/vol: 30.4 (g/mL) G

Lab File ID: _____

% Moisture: 31 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/16/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.5

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	3.1	U
319-85-7	beta-BHC	2.4	U
319-86-8	delta-BHC	2.4	U
58-89-9	gamma-BHC (Lindane)	2.4	U
76-44-8	Heptachlor	2.4	U
309-00-2	Aldrin	2.4	U
1024-57-3	Heptachlor epoxide	2.4	U
959-98-8	Endosulfan I	2.4	U
60-57-1	Dieldrin	4.7	U
72-55-9	4,4'-DDE	* 170 170	U
72-20-8	Endrin	4.7	U
33213-65-9	Endosulfan II	4.7	U
72-54-8	4,4'-DDD	4.7	U
1031-07-8	Endosulfan sulfate	4.7	U
50-29-3	4,4'-DDT	* 340 310	U
72-43-5	Methoxychlor	24	U
53494-70-5	Endrin ketone	4.7	U
7421-93-4	Endrin aldehyde	4.7	U
5103-71-9	alpha-Chlordane	* 64 76	U
5103-74-2	gamma-Chlordane	2.4	U
8001-35-2	Toxaphene	240	U
12674-11-2	Aroclor-1016	47	U
11104-28-2	Aroclor-1221	96	U
11141-16-5	Aroclor-1232	47	U
53469-21-9	Aroclor-1242	47	U
12672-29-6	Aroclor-1248	47	U
11097-69-1	Aroclor-1254	47	U
11096-82-5	Aroclor-1260	440	U

** transferred from dilution*

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1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW2

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.013

Sample wt/vol: 29.9 (g/mL) G

Lab File ID: _____

% Moisture: 19 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/16/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.7

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.1	U
319-85-7	beta-BHC	2.1	U
319-86-8	delta-BHC	2.1	U
58-89-9	gamma-BHC (Lindane)	2.1	U
76-44-8	Heptachlor	2.1	U
309-00-2	Aldrin	2.1	U
1024-57-3	Heptachlor epoxide	2.1	U
959-98-8	Endosulfan I	2.1	U
60-57-1	Dieldrin	4.1	U
72-55-9	4,4'-DDE	4.1	U
72-20-8	Endrin	4.1	U
33213-65-9	Endosulfan II	4.1	U
72-54-8	4,4'-DDD	4.1	U
1031-07-8	Endosulfan sulfate	4.1	U
50-29-3	4,4'-DDT	38	U
72-43-5	Methoxychlor	21	U
53494-70-5	Endrin ketone	4.1	U
7421-93-4	Endrin aldehyde	4.1	U
5103-71-9	alpha-Chlordane	2.1	U
5103-74-2	gamma-Chlordane	2.1	U
8001-35-2	Toxaphene	210	U
12674-11-2	Aroclor-1016	41	U
11104-28-2	Aroclor-1221	83	U
11141-16-5	Aroclor-1232	41	U
53469-21-9	Aroclor-1242	41	U
12672-29-6	Aroclor-1248	41	U
11097-69-1	Aroclor-1254	41	U
11096-82-5	Aroclor-1260	41	U

transferred from dilution

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW3

Lab Name: A4 SCIENTIFIC, INC. Contract: 68W03027
 Lab Code: A4 Case No.: 34156 SAS No.: _____ SDG No.: B1ZT0
 Matrix: (soil/water) SOIL Lab Sample ID: 6115.014
 Sample wt/vol: 30.2 (g/mL) G Lab File ID: _____
 % Moisture: 6 Decanted: (Y/N) N Date Received: 04/30/05
 Extraction: (Type) SONC Date Extracted: 05/08/05
 Concentrated Extract Volume: 5000 (uL) Date Analyzed: 06/06/05
 Injection Volume: 1.0 (uL) Dilution Factor: 1.0
 GPC Cleanup: (Y/N) Y pH: 6.9 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	1.8	U
319-85-7	beta-BHC	1.8	U
319-86-8	delta-BHC	1.8	U
58-89-9	gamma-BHC (Lindane)	1.8	U
76-44-8	Heptachlor	1.8	U
309-00-2	Aldrin	1.8	U
1024-57-3	Heptachlor epoxide	1.8	U
959-98-8	Endosulfan I	1.8	U
60-57-1	Dieldrin	3.5	U
72-55-9	4,4'-DDE	3.5	U
72-20-8	Endrin	3.5	U
33213-65-9	Endosulfan II	3.5	U
72-54-8	4,4'-DDD	3.5	U
1031-07-8	Endosulfan sulfate	3.5	U
50-29-3	4,4'-DDT	3.5	U
72-43-5	Methoxychlor	18	U
53494-70-5	Endrin ketone	3.5	U
7421-93-4	Endrin aldehyde	3.5	U
5103-71-9	alpha-Chlordane	1.8	U
5103-74-2	gamma-Chlordane	1.8	U
8001-35-2	Toxaphene	180	U
12674-11-2	Aroclor-1016	35	U
11104-28-2	Aroclor-1221	71	U
11141-16-5	Aroclor-1232	35	U
53469-21-9	Aroclor-1242	35	U
12672-29-6	Aroclor-1248	35	U
11097-69-1	Aroclor-1254	35	U
11096-82-5	Aroclor-1260	35	U

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW4

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.015

Sample wt/vol: 29.6 (g/mL) G

Lab File ID: _____

% Moisture: 4 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/08/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.4

Sulfur Cleanup: (Y/N) N

 CONCENTRATION UNITS:
 (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	Q
319-84-6	alpha-BHC	1.8 U
319-85-7	beta-BHC	1.8 U
319-86-8	delta-BHC	1.8 U
58-89-9	gamma-BHC (Lindane)	1.8 U
76-44-8	Heptachlor	1.8 U
309-00-2	Aldrin	1.8 U
1024-57-3	Heptachlor epoxide	1.8 U
959-98-8	Endosulfan I	1.8 U
60-57-1	Dieldrin	4.6 U
72-55-9	4,4'-DDE	5.1 U
72-20-8	Endrin	3.5 U
33213-65-9	Endosulfan II	3.5 U
72-54-8	4,4'-DDD	3.5 U
1031-07-8	Endosulfan sulfate	3.5 U
50-29-3	4,4'-DDT	38 U
72-43-5	Methoxychlor	18 U
53494-70-5	Endrin ketone	3.5 U
7421-93-4	Endrin aldehyde	3.5 U
5103-71-9	alpha-Chlordane	3.5 U
5103-74-2	gamma-Chlordane	3.5 U
8001-35-2	Toxaphene	180 U
12674-11-2	Aroclor-1016	35 U
11104-28-2	Aroclor-1221	71 U
11141-16-5	Aroclor-1232	35 U
53469-21-9	Aroclor-1242	35 U
12672-29-6	Aroclor-1248	35 U
11097-69-1	Aroclor-1254	35 U
11096-82-5	Aroclor-1260	35 U

+ transferred from dilution

000000170

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW5

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.016

Sample wt/vol: 29.8 (g/mL) G

Lab File ID: _____

% Moisture: 10 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/10/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.3

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	1.9	U <input checked="" type="checkbox"/>
319-85-7	beta-BHC	1.9	U <input type="checkbox"/>
319-86-8	delta-BHC	1.9	U <input type="checkbox"/>
58-89-9	gamma-BHC (Lindane)	1.9	U <input type="checkbox"/>
76-44-8	Heptachlor	1.9	U <input type="checkbox"/>
309-00-2	Aldrin	1.9	U <input type="checkbox"/>
1024-57-3	Heptachlor epoxide	1.9	U <input type="checkbox"/>
959-98-8	Endosulfan I	1.9	U <input type="checkbox"/>
60-57-1	Dieldrin	3.7	U <input type="checkbox"/>
72-55-9	4,4'-DDE	3.7	U <input type="checkbox"/>
72-20-8	Endrin	3.7	U <input type="checkbox"/>
33213-65-9	Endosulfan II	3.7	U <input type="checkbox"/>
72-54-8	4,4'-DDD	3.7	U <input type="checkbox"/>
1031-07-8	Endosulfan sulfate	3.7	U <input type="checkbox"/>
50-29-3	4,4'-DDT	3.7	U <input type="checkbox"/>
72-43-5	Methoxychlor	19	U <input type="checkbox"/>
53494-70-5	Endrin ketone	3.7	U <input type="checkbox"/>
7421-93-4	Endrin aldehyde	3.7	U <input type="checkbox"/>
5103-71-9	alpha-Chlordane	1.9	U <input type="checkbox"/>
5103-74-2	gamma-Chlordane	1.9	U <input type="checkbox"/>
8001-35-2	Toxaphene	190	U <input type="checkbox"/>
12674-11-2	Aroclor-1016	37	U <input type="checkbox"/>
11104-28-2	Aroclor-1221	75	U <input type="checkbox"/>
11141-16-5	Aroclor-1232	37	U <input type="checkbox"/>
53469-21-9	Aroclor-1242	37	U <input type="checkbox"/>
12672-29-6	Aroclor-1248	37	U <input checked="" type="checkbox"/>
11097-69-1	Aroclor-1254	37	U <input checked="" type="checkbox"/>
11096-82-5	Aroclor-1260	260	U <input checked="" type="checkbox"/>

000000176

1E
 PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW6

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.017

Sample wt/vol: 30.2 (g/mL) G

Lab File ID: _____

% Moisture: 23 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/10/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.8

Sulfur Cleanup: (Y/N) N

 CONCENTRATION UNITS:
 (ug/L or ug/Kg) UG/KG

Q

CAS NO.	COMPOUND		
319-84-6	alpha-BHC	2.2	U
319-85-7	beta-BHC	2.2	U
319-86-8	delta-BHC	2.2	U
58-89-9	gamma-BHC (Lindane)	2.2	U
76-44-8	Heptachlor	2.2	U
309-00-2	Aldrin	2.2	U
1024-57-3	Heptachlor epoxide	2.2	U
959-98-8	Endosulfan I	2.2	U
60-57-1	Dieldrin	4.3	U
72-55-9	4,4'-DDE	30	U
72-20-8	Endrin	4.3	U
33213-65-9	Endosulfan II	4.3	U
72-54-8	4,4'-DDD	4.3	U
1031-07-8	Endosulfan sulfate	4.3	U
50-29-3	4,4'-DDT	* 75	U
72-43-5	Methoxychlor	22	U
53494-70-5	Endrin ketone	4.3	U
7421-93-4	Endrin aldehyde	4.3	U
5103-71-9	alpha-Chlordane	* 62	U
5103-74-2	gamma-Chlordane	22	U
8001-35-2	Toxaphene	220	U
12674-11-2	Aroclor-1016	43	U
11104-28-2	Aroclor-1221	86	U
11141-16-5	Aroclor-1232	43	U
53469-21-9	Aroclor-1242	43	U
12672-29-6	Aroclor-1248	43	U
11097-69-1	Aroclor-1254	43	U
11096-82-5	Aroclor-1260	240	U

* transferred from dilution

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW7

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.018

Sample wt/vol: 30.4 (g/mL) G

Lab File ID: _____

% Moisture: 9 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/06/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.5

Sulfur Cleanup: (Y/N) N

CAS NO. COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Q

319-84-6	alpha-BHC	1.8	U	7
319-85-7	beta-BHC	1.8	U	
319-86-8	delta-BHC	1.8	U	
58-89-9	gamma-BHC (Lindane)	1.8	U	
76-44-8	Heptachlor	1.8	U	
309-00-2	Aldrin	1.8	U	
1024-57-3	Heptachlor epoxide	1.8	U	
959-98-8	Endosulfan I	1.8	U	
60-57-1	Dieldrin	3.6	U	
72-55-9	4,4'-DDE	3.6	U	
72-20-8	Endrin	3.6	U	
33213-65-9	Endosulfan II	3.6	U	
72-54-8	4,4'-DDD	3.6	U	
1031-07-8	Endosulfan sulfate	3.6	U	
50-29-3	4,4'-DDT	3.6	U	
72-43-5	Methoxychlor	18	U	
53494-70-5	Endrin ketone	3.6	U	
7421-93-4	Endrin aldehyde	3.6	U	
5103-71-9	alpha-Chlordane	1.8	U	
5103-74-2	gamma-Chlordane	1.8	U	
8001-35-2	Toxaphene	180	U	
12674-11-2	Aroclor-1016	36	U	
11104-28-2	Aroclor-1221	73	U	
11141-16-5	Aroclor-1232	36	U	
53469-21-9	Aroclor-1242	36	U	
12672-29-6	Aroclor-1248	36	U	
11097-69-1	Aroclor-1254	36	U	
11096-82-5	Aroclor-1260	36	U	7

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

B1ZW8

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.019

Sample wt/vol: 29.6 (g/mL) G

Lab File ID: _____

% Moisture: 25 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/16/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.6

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.3	U
319-85-7	beta-BHC	2.3	U
319-86-8	delta-BHC	2.3	U
58-89-9	gamma-BHC (Lindane)	2.3	U
76-44-8	Heptachlor	2.3	U
309-00-2	Aldrin	2.3	U
1024-57-3	Heptachlor epoxide	2.3	U
959-98-8	Endosulfan I	2.3	U
60-57-1	Dieldrin	4.5	U
72-55-9	4,4'-DDE	17	U
72-20-8	Endrin	4.5	U
33213-65-9	Endosulfan II	4.5	U
72-54-8	4,4'-DDD	4.5	U
1031-07-8	Endosulfan sulfate	4.5	U
50-29-3	4,4'-DDT	42	U
72-43-5	Methoxychlor	23	U
53494-70-5	Endrin ketone	4.5	U
7421-93-4	Endrin aldehyde	4.5	U
5103-71-9	alpha-Chlordane	* 110 100	EP IN
5103-74-2	gamma-Chlordane	* 55 43	EP IN
8001-35-2	Toxaphene	230	U
12674-11-2	Aroclor-1016	45	U
11104-28-2	Aroclor-1221	91	U
11141-16-5	Aroclor-1232	45	U
53469-21-9	Aroclor-1242	45	U
12672-29-6	Aroclor-1248	45	U
11097-69-1	Aroclor-1254	45	U
11096-82-5	Aroclor-1260	45	U

* transferred from dilution

PESTICIDE ORGANICS ANALYSIS DATA SHEET

B1ZW9

Lab Name: A4 SCIENTIFIC, INC.

Contract: 68W03027

Lab Code: A4

Case No.: 34156

SAS No.: _____

SDG No.: B1ZT0

Matrix: (soil/water) SOIL

Lab Sample ID: 6115.020

Sample wt/vol: 30.4 (g/mL) G

Lab File ID: _____

% Moisture: 9 Decanted: (Y/N) N

Date Received: 04/30/05

Extraction: (Type) SONC

Date Extracted: 05/08/05

Concentrated Extract Volume: 5000 (uL)

Date Analyzed: 06/06/05

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y

pH: 6.4

Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Q

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	1.8	U
319-85-7	beta-BHC	1.8	U
319-86-8	delta-BHC	1.8	U
58-89-9	gamma-BHC (Lindane)	1.8	U
76-44-8	Heptachlor	1.8	U
309-00-2	Aldrin	1.8	U
1024-57-3	Heptachlor epoxide	1.8	U
959-98-8	Endosulfan I	1.8	U
60-57-1	Dieldrin	8.6	U
72-55-9	4,4'-DDE	9.4	U
72-20-8	Endrin	3.6	U
33213-65-9	Endosulfan II	3.6	U
72-54-8	4,4'-DDD	3.6	U
1031-07-8	Endosulfan sulfate	3.6	U
50-29-3	4,4'-DDT	19	U
72-43-5	Methoxychlor	18	U
53494-70-5	Endrin ketone	3.6	U
7421-93-4	Endrin aldehyde	3.6	U
5103-71-9	alpha-Chlordane	4.6	U
5103-74-2	gamma-Chlordane	2.3	U
8001-35-2	Toxaphene	180	U
12674-11-2	Aroclor-1016	36	U
11104-28-2	Aroclor-1221	73	U
11141-16-5	Aroclor-1232	36	U
53469-21-9	Aroclor-1242	36	U
12672-29-6	Aroclor-1248	36	U
11097-69-1	Aroclor-1254	36	U
11096-82-5	Aroclor-1260	36	U

000000223



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REMOVAL SUPPORT TEAM
EPA CONTRACT 68-W-00-113

June 29, 2005

Mr. Nicholas Magriples, On Scene Coordinator
U.S. Environmental Protection Agency
Removal Action Branch
2890 Woodbridge Avenue
Edison, NJ 08837

EPA CONTRACT NUMBER: 68-W-00-113
TECHNICAL DIRECTIVE DOCUMENT.: 02-05-04-0005
DOCUMENT CONTROL NUMBER: RST-02-F-01856
SUBJECT: XRF ANALYSIS REPORT
MATTEO IRON AND METAL SITE
WEST DEPTFORD, GLOUCESTER COUNTY, NEW JERSEY

Dear Mr Magriples:

Please find the XRF Analysis Report for the sampling and field testing event conducted at the Matteo Iron and Metal Site in West Deptford, New Jersey on April 27-29, 2005. If you have any comments or questions, please contact me at (732) 225-6116, extension 213.

Sincerely,
WESTON SOLUTIONS, INC.

Michael Mahnkopf
Project Manager

cc: TDD File





X-RAY FLUORESCENCE ANALYSIS REPORT

MATTEO IRON AND METAL

Prepared by:

Removal Support Team
Weston Solutions, Inc.
Federal Programs Division
Edison, New Jersey


Prepared for:

U.S. Environmental Protection Agency
Region II, Removal Action Branch
Edison, New Jersey

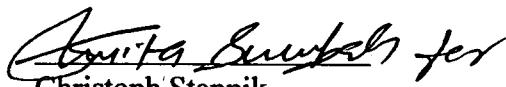
DCN: RST-02-F-01856
TDD No.: 02-05-04-0005
EPA Contract No.: 68-W-00-113

Approved By:

RST


Michael Mahnkopf
Project Manager

Date: 6/29/05


Christoph Stannik
Group Leader

Date: 6/29/05

EPA

Nicholas Magriples
On-Scene Coordinator

Date: _____

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1.0 INTRODUCTION/PROJECT DESCRIPTION

This report summarizes and provides a correlation between the X-Ray Fluorescence (XRF) and the USEPA Contract Laboratory Program (CLP) analytical data, specifically lead (Pb), generated during the April 27-29, 2005 sampling episode. The sampling episode was a joint effort between Weston Solutions' Removal Support Team (RST) and Site Assessment Team (SAT). Soil samples were collected and analyzed in support of a CERCLA Integrated Assessment (IA) for the Matteo Iron and Metal Site. During this assessment, RST collected soil samples and SAT provided on-site analytical services using XRF to measure the concentrations of lead and other heavy metals in soils. Based on the XRF results, a select number of soil samples were submitted for laboratory analysis under the CLP.

2.0 BACKGROUND

The Matteo Iron and Metal Facility is located at 1708 Route 130, West Deptford Township, Gloucester County, New Jersey (see Figure 1 - Site Location Map). The site had historically been a farm and is currently used as a scrap metal recycling facility. The southeastern portion of the site (approximately 5 acres) is mostly paved and contains several buildings which support the scrap metal recycling business. The remainder of the site (approximately 75 acres) was used as a landfill and is mostly heavily vegetated, undeveloped land with borders Woodbury Creek to the west, Hessian Run to the north and a residential trailer park to the south. The site is located approximately one mile east of the Delaware River. In the past, batteries were recycled using both crushing and burning operations. Wire was also burned for the recovery of metal. Early Responsible Party and New Jersey Department of Environmental Protection (NJDEP) investigations identified polychlorinated biphenyls (PCBs) and high levels of lead and cadmium in Site soils and lead in a Site potable well. A NJDEP Remedial Investigation conducted between September 2000 and October 2000 revealed the volume of waste material landfilled at the Site to be 80,000 cubic yards, of which 23,000 cubic yards consisted of crushed battery casings; 22,000 cubic yards consisted of crushed battery casings mixed with general waste; and the remaining 35,000 cubic yards consisted of general waste. Lead was also found in the sediments of the Hessian Run and in the marsh areas adjacent to the battery casing disposal area.

3.0 SAMPLING DESIGN

The Region 2 Site Assessment Team (SAT) was tasked to confirm or deny the presence of lead contamination on the Matteo property and at the adjacent property, the Willow Woods Trailer Park. As part of this investigation, a total of 80 surface (0-6") soil samples were collected from the following locations (see Figure 2 - Sample Location Map):

1. the Matteo property in areas of previously identified PCB contamination;
2. along the boundary of the Matteo property and the adjacent trailer park;
3. the trailer park;

4. a residence located adjacent to the scrap yard to the east; and
5. Crown Point Road.

The soil sample locations were determined by SAT by placing a 200-foot grid over areas on the Matteo property where surficial PCB contamination was previously revealed in the Final Remedial Investigation Report (RI) completed in May 2004 by the Louis Berger Group, Inc.

A 100-foot grid was placed along the boundary of the trailer park and the Matteo property in order to determine if contamination observed at the Matteo property was affecting the trailer park. A 200-foot grid was placed over the Willow Woods Trailer Park to confirm or deny the presence of PCBs and lead in the trailer park. Soil samples collected in the trailer park were collected from the lawns of the trailer homes.

Two samples (ROAD A and ROAD B) were collected from dirt accumulated on the street curb on Crown Point Road just outside of the Matteo Iron and Metal facility entrance. Two surface (0-6") soil samples (ROAD C and ROAD D) were collected from dirt a pathway situated between the scrap yard and the residence to the east of the yard. Additionally, three background surface (0-6") soil samples were collected in an area east of the scrap yard.

SAT screened a total of 96 soil samples, including eight duplicates and eight replicates, for total Pb utilizing an XRF instrument (see Table 1 for XRF results). In order to meet project specific quality assurance requirements, 19 samples, including one duplicate, were sent to a laboratory for confirmation Pb analysis out of the total of 80 locations that were analyzed using the XRF. Soil samples were submitted to Ceimic Corporation, 10 Dean Knauss Drive, Narragansett, RI 02882, (401) 782-8700. See Table 2 for the comparison of XRF Pb results and laboratory total Pb results. It should be noted that one soil sample (MIM-SO-011) was collected from a background location (BKG S03) and submitted for laboratory analysis only. This location was not field screened utilizing XRF.

4.0 SAMPLE PREPARATION - PREPARED CUP METHOD

Prior to sampling, each sampling location was prepared by removing debris and rocks from the sample area. Approximately 8 ounces of soil were collected using dedicated plastic scoops, homogenized in disposable aluminum pans and placed in 1-gallon, sealable, plastic bags.

All samples were transferred into polyethylene XRF cups prior to analysis. The prepared cup method typically involves drying the sample in a sample oven and using a sieve to make the sample uniform throughout. These steps were not performed with these samples due to the long preparation time associated with this method. Efforts to eliminate any rocks or debris from the soil during homogenization were emphasized throughout the event. According to the Niton XRF manual, moisture content does not significantly effect the results unless there is a moisture content greater than 20%.

Of the 20 samples sent to the laboratory for confirmation analysis, only one sample (MIM-SO-002) exhibited a significant moisture content greater than 20% (66.8%). Based on the typical low moisture content and equipment manufacturer's information on the performance of the instrument, the Niton XRF readings should not have been affected significantly by moisture.

Replicate analyses were performed by conducting a second, consecutive analysis on the same XRF cup (Table 3). Duplicate analyses were performed by creating a second XRF sample cup from the same homogenized soil sample (Table 4).

5.0 XRF ANALYSIS

A Niton XLi 722 Field Portable XRF (Serial Number 5829) was used for the analysis. The unit is equipped with two radioactive isotope sources: Cd^{109} and Am^{241} . An acquisition time of 120 seconds was selected in order to achieve a detection level of less than 15 ppm (60 seconds) for lead listed in the Niton XRF manufacturer's literature (see Appendix 1).

At the start of each sample day, a calibration was performed to assure that the instrument was operating properly. Additionally, three National Institute of Standards and Technology (NIST) standards (NIST 2709, 2710 and 2711) and a blank were analyzed as detailed in the following sections.

Sample replicates were analyzed for at least 10% of the sample locations. The letter "R" was added to the end of the sample identification for that sample. Replicate samples are a second analysis of the same sample in order to verify consistent operation of the XRF unit. Individual results of the replicate analyses can be found in Table 3. The average relative percent difference for replicate analyses performed at the Matteo Iron and Metal Site was 10.27%.

Duplicate samples were prepared and analyzed for at least 10% of the sample locations. The letter "D" was added to the end of the sample identification for the corresponding sample. Duplicate analyses are used to verify the homogeneity of the bagged sample. Individual results of the duplicate analyses can be found in Table 4. The average relative percent difference (RPD) for duplicate analyses performed at the Matteo Iron and Metal Site was 13.52%.

For duplicate and replicate analyses in which one or both of the results were below the calculated Method Detection Limit (MDL), the RPD was not calculated.

XRF analysis was conducted in accordance with EPA/REAC Niton XLi 722 Field Portable X-Ray Fluorescence Standard Operating Procedures Draft SOP #1700 (Appendix 2), as well as the instrument instruction manual.

6.0 DETECTION AND QUANTITATION LIMITS

A low concentration standard, NIST 2709, with a certified lead concentration of 18.9 ppm, was analyzed at the beginning of each day of analysis (Table 5). The standard deviation (SD) of the non-consecutive analyses was used to calculate the method detection limit (MDL) and method quantitation limit (MQL) for lead. The MDL is defined as three times the SD of the analyses in ppm, while the MQL is defined as ten times the SD in ppm. The calculated MDL for lead at the Matteo Iron and Metal Site was 13.09 ppm and the calculated MQL was 43.64 ppm.

7.0 APPLICATION MODEL VERIFICATION

The Niton XLi 722 fundamental principles of operation were verified by the analysis of a mid-concentration standard, NIST #2711, with a certified lead concentration of 1,162 ppm, and a high-concentration standard, NIST #2710, with a certified lead concentration of 5,532 ppm. These standards were run following the NIST #2709 standard and the results of these standards were used to estimate the precision and accuracy of the Niton XLi 722. Individual results of the analysis of Standards NIST #2710 and NIST #2711 can be found in Tables 6 and 7, respectively.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

The following Quality Assurance (QA) protocols were used to insure the integrity of the data collected by the Niton XLi 722S:

1. The use of chain of custody forms and field logs.
2. Daily instrument checks (Calibration and Zero Check)
3. Initial and continuing analysis of NIST standards and a sand blank.
4. Field duplicates and replicates were analyzed for at least 10% of the samples.
5. Minimum MDL and MQL were calculated for the lead.

Table 8 provides a summary of the QA data (NIST Standards, SIOs blanks, duplicates, replicates, calibrations) generated under this project.

8.1 NIST Results

Table 5 details the raw data for the non-consecutive analysis of the NIST #2709 standard for lead. Statistics are provided for the data. The calculated MDL of 13.09 ppm and MQL of 43.64 ppm were used to qualify the data with a "U" for data below the MDL and a "J" for values between the MDL and the MQL.

Tables 6 and 7 also detail the data results of the non-consecutive analyses of standards NIST #2710 and #2711, respectively. The NIST certified lead concentration in standard #2710 is 5,532 ppm.

The average result obtained via XRF analysis was 5290.18 ppm. The percent difference (%D) between the certified concentration and the average measured concentration is 4.37%, which is within the acceptable range of +/- 20% as specified in Section 9.4 of EPA Test Method 6200 (see Appendix 3).

For standard #2711, the NIST certified value for lead is 1,162 ppm. The average result obtained from the XRF was 1062.03 ppm. The percent difference (%D) between the certified concentration and the average measured concentration is 8.60%, which is within the acceptable range of +/- 20% as specified in Section 9.4 of EPA Test Method 6200 (see Appendix 3).

The respective relative standard deviations (RSD) for standards #2710 and #2711 were 1.73% and 2.92%. Both of these percentages were less than 20% as specified in Section 9.5 of EPA Test Method 6200 (see Appendix 3).

8.2 Replicate and Duplicate Results

Table 3 contains a summary of the replicate samples analyzed by the Niton XLi 722. Eight samples were analyzed in replicate. Since sample TPS-10R exhibited a Pb concentration less than the MDL of 13.09 ppm, its concentration, along with that of sample TPS-10, were not used for statistical analysis purposes. The Relative Percent Differences (RPDs) between the remaining seven samples and their replicates ranged from 0.69% to 19.03% and averaged 10.27% RPD for lead.

Table 4 contains a summary of the duplicate samples analyzed by the Niton XLi 722. Eight samples were analyzed in duplicate. Since sample BIAS-5 and its duplicate BIAS-5D both exhibited Pb concentrations less than the MDL of 13.09 ppm, their concentrations were not used for statistical analysis purposes. The RPDs between the samples and duplicates ranged from 0.39% to 43.47%, with an average of 13.52%. The results for the duplicate samples indicates that the duplicate samples were relatively homogenous and the sampling method was consistent.

8.3 Regression Analysis

This sampling event was designated QA-2 for field screening. Nineteen XRF confirmation samples were delivered to Ceimic Corporation for TAL metals analysis on April 29, 2005. The results of the 19 confirmation analyses are included in Table 9. Of the 19 pairs of results, all results pairs were considered in the regression analysis.

The subsequent regression resulted in an R-square value of 0.968. This value exceeds the requirement of the coefficient of determination (r^2) value of greater than 0.7 to meet QA-2 accuracy and for the XRF data to be considered screening level data..

9.0 SAMPLE RESULTS AND DISCUSSION

Analytical results indicated that 10 out of the 20 soil samples submitted for laboratory analysis exhibited total Pb concentrations in excess of its New Jersey Department of Environmental Protection (NJDEP), Residential Direct Contact Cleanup Criteria (RDCSCC) of 400 ppm. Concentrations ranged from 410 ppm to 27,900 ppm. It should be noted that based on data validation, all Pb concentrations were qualified as estimated (J). Total Pb concentrations are summarized in Table 2. The analytical results (Form I's) and the data validation package are included in Appendix 4.

Table 1
XRF Field Screening Results
Matteo Scrap Iron and Metal

Date	Sample ID	Pb (ppm)	Sample Depth
27-Apr-05	OS-S11	85.12	0-6"
27-Apr-05	OS-S08	294.89	0-6"
27-Apr-05	S35-1N	191.05	0-6"
27-Apr-05	S34-N3	697.38	0-6"
27-Apr-05	S22-S12	130.93	0-6"
27-Apr-05	OS-S05	53.53	0-6"
27-Apr-05	OS-S14	279.39	0-6"
27-Apr-05	OS-S01	56.8	0-6"
27-Apr-05	OS-S01D	59.66	0-6"
27-Apr-05	OS-S02	31.67	0-6"
27-Apr-05	OS-S02R	38.33	0-6"
27-Apr-05	OS-S04	113.89	0-6"
27-Apr-05	PB-12S3	1413.49	0-6"
27-Apr-05	OS-S09	844.67	0-6"
27-Apr-05	S2-8E1	141.16	0-6"
27-Apr-05	S2-8E1D	128.01	0-6"
27-Apr-05	S22-N15	63.84	0-6"
28-Apr-05	OS-S06	109.14	0-6"
28-Apr-05	OS-S07	11956.09	0-6"
28-Apr-05	OS-S07R	11579.45	0-6"
28-Apr-05	OS-S12	13173.35	0-6"
28-Apr-05	OS-S03	42.99	0-6"
28-Apr-05	OS-S13	1356.53	0-6"
28-Apr-05	OS-S10	10156.38	0-6"
28-Apr-05	B-S29	443.66	0-6"
28-Apr-05	B-S26	56.57	0-6"
28-Apr-05	B-S17	41.91	0-6"
28-Apr-05	BIAS-2	55.27	0-6"
28-Apr-05	B-S30	112.37	0-6"
28-Apr-05	BIAS-1	275.52	0-6"
28-Apr-05	B-S28	184.92	0-6"
28-Apr-05	B-S28R	158.46	0-6"
28-Apr-05	B-S23	277.33	0-6"
28-Apr-05	B-S19	66.6	0-6"
28-Apr-05	B-S21	60.05	0-6"
28-Apr-05	B-S21D	52.1	0-6"
28-Apr-05	ROAD-B	71.53	0-6"
28-Apr-05	B-S15	50.21	0-6"
28-Apr-05	B-S07	34	0-6"
28-Apr-05	B-S10	56.83	0-6"
28-Apr-05	BIAS-5	10.8	0-6"
28-Apr-05	BIAS-5D	6.2	0-6"
28-Apr-05	B-S11	42.45	0-6"
28-Apr-05	ROAD-A	332.91	0-6"
28-Apr-05	ROAD-AR	336.55	0-6"
28-Apr-05	BIAS-4	33.55	0-6"

Table 1
XRF Field Screening Results
Matteo Scrap Iron and Metal

Date	Sample ID	Pb (ppm)	Sample Depth
28-Apr-05	BIAS-3	45.06	0-6"
28-Apr-05	B-S13	35.07	0-6"
28-Apr-05	ROAD-C	364.57	0-6"
28-Apr-05	ROAD-D	380.12	0-6"
28-Apr-05	BKG-S01	665.74	0-6"
28-Apr-05	BKG-S02	177.34	0-6"
28-Apr-05	B-S08	15.47	0-6"
28-Apr-05	B-S03	23.65	0-6"
28-Apr-05	B-S04	120.41	0-6"
28-Apr-05	B-S05	35.26	0-6"
28-Apr-05	B-S05D	22.67	0-6"
28-Apr-05	B-S01	31.29	0-6"
28-Apr-05	B-S02	62.56	0-6"
28-Apr-05	B-S02R	54.08	0-6"
28-Apr-05	B-S09	37.11	0-6"
28-Apr-05	B-S12	63.19	0-6"
28-Apr-05	TP-S01	60.5	0-6"
28-Apr-05	B-S16	46.53	0-6"
28-Apr-05	B-S14	51.26	0-6"
28-Apr-05	B-S06	12.85	0-6"
28-Apr-05	B-S24	906.16	0-6"
28-Apr-05	B-S24D	902.67	0-6"
28-Apr-05	B-S18	112.68	0-6"
28-Apr-05	B-S20	8.85	0-6"
28-Apr-05	B-S22	64.74	0-6"
28-Apr-05	B-S22R	56.04	0-6"
28-Apr-05	B-S27	305.72	0-6"
28-Apr-05	B-S27D	294.52	0-6"
28-Apr-05	B-S31	188.92	0-6"
28-Apr-05	B-S25	714.97	0-6"
28-Apr-05	B-S25R	719.95	0-6"
29-Apr-05	TPS-11	59.32	0-6"
29-Apr-05	TPS-17	160.54	0-6"
29-Apr-05	TPS-13	100.16	0-6"
29-Apr-05	TPS-15	173.58	0-6"
29-Apr-05	TPS-16	94.39	0-6"
29-Apr-05	TPS-12	87.17	0-6"
29-Apr-05	TPS-14	72.62	0-6"
29-Apr-05	TPS-04	68.79	0-6"
29-Apr-05	TPS-05	29.59	0-6"
29-Apr-05	TPS-18	99.18	0-6"
29-Apr-05	TPS-06	73.34	0-6"
29-Apr-05	TPS-07	69.75	0-6"
29-Apr-05	TPS-08	37.09	0-6"
29-Apr-05	TPS-10	14.18	0-6"
29-Apr-05	TPS-10R	2.86	0-6"

Table 1
XRF Field Screening Results
Matteo Scrap Iron and Metal

Date	Sample ID	Pb (ppm)	Sample Depth
29-Apr-05	TPS-03	65.26	0-6"
29-Apr-05	TPS-02	32.5	0-6"
29-Apr-05	TPS-08D	31.14	0-6"
29-Apr-05	TPS-09	59.54	0-6"

D = Duplicate

R = Replicate

Table 2
XRF Lead Results vs.
Laboratory Total Lead Results
Matteo Iron and Metal

RST Sample ID	CLP Inorganic No.	Location	XRF Result (ppm)	Laboratory Result (ppm)	NJDEP/RDCSCC (ppm)
MIM-SO-001	MB1ZT0	S22 S12	130.93	153 J	400
MIM-SO-002	MB1ZT1	OS-S12	13173.35	27,900 J	400
MIM-SO-003	MB1ZT2	OS-S02	31.67	43 J	400
MIM-SO-004	MB1ZT3	B-S29	443.66	633 J	400
MIM-SO-005	MB1ZT4	OS-S10	10156.38	15,100 J	400
MIM-SO-006	MB1ZT5	ROAD D	380.12	291 J	400
MIM-SO-007	MB1ZT6	PB 12 S3	1413.49	3,850 J	400
MIM-SO-008	MB1ZT7	BKG S01	665.74	765 J	400
MIM-SO-009	MB1ZT8	BKG S02	177.34	183 J	400
MIM-SO-010	MB1ZT9	B-S29	443.66	622 J	400
MIM-SO-011	MB1ZW0	BKG S03	Not screened	1,400 J	400
MIM-SO-012	MB1ZW1	B-S24	906.16	1,520 J	400
MIM-SO-013	MB1ZW2	B-S25	714.97	973 J	400
MIM-SO-014	MB1ZW3	TP-S10	14.18	18.1 J	400
MIM-SO-015	MB1ZW4	B-S20	8.85	9.6 J	400
MIM-SO-016	MB1ZW5	TP-S17	160.54	161 J	400
MIM-SO-017	MB1ZW6	B-S27	305.72	410 J	400
MIM-SO-018	MB1ZW7	TP-S05	29.59	25.2 J	400
MIM-SO-019	MB1ZW8	TP-S03	65.26	80.6 J	400
MIM-SO-020	MB1ZW9	TP-S13	100.16	93.5 J	400

J = result is qualified as estimated

NJDEP/RDCSCC = New Jersey Department of Environmental Protection/Residential Direct Contact Cleanup Criteria

Table 3
Comparison of Replicate XRF Results
Matteo Iron and Metal

Date	Sample ID	Lead (ppm)	Qualifier	Relative Percent Difference	Quality Assurance
27-Apr-05	OS-S02	31.67	J	19.03	Sample
27-Apr-05	OS-S02R	38.33	J		Replicate
28-Apr-05	OS-S07	11956.09		3.20	Sample
28-Apr-05	OS-S07R	11579.45			Replicate
28-Apr-05	B-S28	184.92		15.41	Sample
28-Apr-05	B-S28R	158.46			Replicate
28-Apr-05	ROAD-A	332.91		1.09	Sample
28-Apr-05	ROAD-AR	336.55			Replicate
28-Apr-05	B-S02	62.56		14.54	Sample
28-Apr-05	B-S02R	54.08			Replicate
28-Apr-05	B-S22	64.74		17.94	Sample
28-Apr-05	B-S22R	54.08			Replicate
28-Apr-05	B-S25	714.97		0.69	Sample
28-Apr-05	B-S25R	719.95			Replicate
29-Apr-05	TPS-10	14.18	J	132.86	Sample
29-Apr-05	TPS-10R	2.86	ND		Replicate

Average RPD

10.27

Table 4
Comparison of Duplicate XRF Results
Matteo Iron and Metal

Date	Sample ID	Lead (ppm)	Qualifier	Relative Percent Difference	Quality Assurance
27-Apr-05	OS-S01	56.8		4.91	Sample
27-Apr-05	OS-S01D	59.66			Duplicate
27-Apr-05	S2-8E1	141.16		9.77	Sample
27-Apr-05	S2-8E1D	128.01			Duplicate
28-Apr-05	B-S21	60.5		14.92	Sample
28-Apr-05	B-S21D	52.1			Duplicate
29-Apr-05	TPS-08	37.09	J	17.44	Sample
29-Apr-05	TPS-08D	31.14	J		Duplicate
28-Apr-05	B-S05	35.26	J	43.47	Sample
28-Apr-05	B-S05D	22.67	J		Duplicate
28-Apr-05	B-S24	906.16		0.39	Sample
28-Apr-05	B-S24D	902.67			Duplicate
28-Apr-05	B-S27	305.72		3.73	Sample
28-Apr-05	B-S27D	294.52			Duplicate
28-Apr-05	BIAS-5	10.8	ND	54.12	Sample
28-Apr-05	BIAS-5D	6.2	ND		Duplicate

Average RPD

13.52

Table 5
XRF Analysis of NIST Standard 2709
Matteo Iron and Metal

Sample Date	NIST Standard	Pb (ppm)
27-Apr-05	2709	19.74
27-Apr-05	2709	19.99
28-Apr-05	2709	11.93
28-Apr-05	2709	22.73
28-Apr-05	2709	12
28-Apr-05	2709	18.15
28-Apr-05	2709	19.92
29-Apr-05	2709	23.41

NIST Certified Value	18.9
Average in ppm	18.48
Standard Deviation (SD)	4.36
Percent Relative Standard Deviation (%RSD)	23.61
Method Detection Limit (MDL)	13.09
Method Quantification Limit (MQL)	43.64

Sample Date	NIST Standard	Pb (ppm)
27-Apr-05	2710	5448.15
27-Apr-05	2710	5339.34
28-Apr-05	2710	5323.47
28-Apr-05	2710	5342.06
28-Apr-05	2710	5189.26
28-Apr-05	2710	5198.57
28-Apr-05	2710	5283.76
28-Apr-05	2710	5196.84

NIST Certified Value	5532
Average in ppm	5290.18
Standard Deviation (SD)	91.42
Percent Relative Standard Deviation (%RSD)	1.73

Table 7
XRF Analysis of NIST Standard 2711
Matteo Iron and Metal

Sample Date	NIST Standard	Pb (ppm)
27-Apr-05	2711	1081.56
27-Apr-05	2711	1016.22
28-Apr-05	2711	1072.17
28-Apr-05	2711	1119.81
28-Apr-05	2711	1068.39
28-Apr-05	2711	1048.96
28-Apr-05	2711	1042.48
29-Apr-05	2711	1046.61

NIST Certified Value	1162
Average in ppm	1062.03
Standard Deviation (SD)	31.06
Percent Relative Standard Deviation (%RSD)	2.92

Table 8
XRF Field Screening
Quality Assurance Data
Matteo Scrap
Iron and Metal

Reading No	Time	Analysis Mode	Duration	Sample ID	Resolution	Pb (ppm)	Quality Assurance
1	4/27/2005 12:00	SHUTTER CAL	40.81		314.38		calibration
3	4/27/2005 12:27	SHUTTER CAL	42.8		318.51		calibration
4	4/27/2005 12:36	BULK	120	2709		19.74	low standard
5	4/27/2005 12:40	BULK	120	2710		5448.15	high standard
7	4/27/2005 12:51	BULK	120	2711		1081.56	medium standard
16	4/27/2005 15:08	BULK	120	OS-S01		56.80	duplicate
17	4/27/2005 15:13	BULK	120	OS-S01D		59.66	duplicate
18	4/27/2005 15:18	BULK	120	OS-S02		31.67	replicate
19	4/27/2005 15:23	BULK	120	OS-S02R		38.33	replicate
21	4/27/2005 15:35	SHUTTER CAL	42.8		322.30		calibration
22	4/27/2005 15:43	BULK	120	SIO2		-4.75	blank
23	4/27/2005 15:48	BULK	120	2709		19.99	low standard
24	4/27/2005 15:52	BULK	120	2710		5339.34	high standard
25	4/27/2005 15:56	BULK	120	2711		1016.22	medium standard
30	4/27/2005 17:49	BULK	120	S2-8E1		141.16	duplicate
31	4/27/2005 18:16	BULK	120	S2-8E1D		128.01	duplicate
34	4/28/2005 8:17	BULK	120	OS-S07		11956.09	replicate
35	4/28/2005 8:38	BULK	120	OS-S07R		11579.45	replicate
41	4/28/2005 9:14	SHUTTER CAL	42.77		313.05		calibration
42	4/28/2005 9:22	BULK	120	SIO2		1.57	blank
43	4/28/2005 9:27	BULK	120	2709		11.93	low standard
44	4/28/2005 9:33	BULK	120	2710		5323.47	high standard
45	4/28/2005 9:38	BULK	120	2711		1072.17	medium standard
53	4/28/2005 11:07	BULK	120	B-S28		184.92	replicate
54	4/28/2005 11:11	BULK	120	B-S28R		158.46	replicate
57	4/28/2005 11:25	BULK	120	B-S21		60.05	duplicate
58	4/28/2005 11:30	BULK	120	B-S21D		52.1	duplicate
59	4/28/2005 11:32	SHUTTER CAL	42.77		317.01		calibration
60	4/28/2005 11:37	BULK	120	SIO2		-1.88	blank
61	4/28/2005 11:41	BULK	120	2709		22.73	low standard
62	4/28/2005 11:46	BULK	120	2710		5342.06	high standard
63	4/28/2005 11:55	BULK	120	2711		1119.81	medium standard
70	4/28/2005 13:17	BULK	120	BIAS-5		10.8	duplicate
71	4/28/2005 13:22	BULK	120	BIAS-5D		6.2	duplicate
73	4/28/2005 13:34	BULK	120	ROAD-A		332.91	replicate
74	4/28/2005 13:38	BULK	120	ROAD-AR		336.55	replicate
78	4/28/2005 13:54	SHUTTER CAL	42.8		314.78		calibration
79	4/28/2005 13:59	BULK	120	SIO2		0.69	blank
80	4/28/2005 14:06	BULK	119.86	2709		12	low standard
82	4/28/2005 14:17	BULK	120	2710		5189.26	high standard
83	4/28/2005 14:23	BULK	120	2711		1068.39	medium standard
92	4/28/2005 15:24	BULK	120	B-S05		35.26	duplicate
93	4/28/2005 15:29	BULK	120	B-S05D		22.67	duplicate
95	4/28/2005 15:39	BULK	120	B-S02		62.56	replicate
96	4/28/2005 15:43	BULK	120	B-S02R		54.08	replicate
97	4/28/2005 15:47	SHUTTER CAL	40.86		307.61		calibration
98	4/28/2005 15:51	BULK	120	SIO2		3.06	blank
99	4/28/2005 15:56	BULK	120	2709		18.15	low standard
100	4/28/2005 16:06	BULK	120	2710		5198.57	high standard
101	4/28/2005 16:25	BULK	120	2711		1048.96	medium standard
109	4/28/2005 17:19	BULK	120	B-S24		906.16	duplicate
110	4/28/2005 17:27	BULK	120	B-S24D		902.67	duplicate
113	4/28/2005 17:41	BULK	120	B-S22		64.74	replicate
114	4/28/2005 17:45	BULK	120	B-S22R		56.04	replicate
115	4/28/2005 17:58	SHUTTER CAL	42.78		312.76		calibration
116	4/28/2005 18:10	BULK	120	SIO2		1.31	blank
117	4/28/2005 18:16	BULK	120	2709		19.92	low standard
118	4/28/2005 18:26	BULK	120	2710		5283.76	high standard
119	4/28/2005 18:31	BULK	120	2711		1042.48	medium standard
121	4/28/2005 18:42	BULK	120	B-S27		305.72	duplicate
122	4/28/2005 18:48	BULK	120	B-S27D		294.52	duplicate
126	4/28/2005 19:08	BULK	120	B-S25		714.97	replicate
127	4/28/2005 19:12	BULK	120	B-S25R		719.95	replicate
135	4/29/2005 8:55	SHUTTER CAL	42.78		325.75		calibration
136	4/29/2005 9:04	BULK	120	SIO2		-10.05	blank
137	4/29/2005 9:10	BULK	120	2709		23.41	low standard
138	4/29/2005 9:17	BULK	120	2710		5196.84	high standard
139	4/29/2005 9:21	BULK	120	2711		1046.61	medium standard
146	4/29/2005 10:32	BULK	120	TPS-08		37.09	duplicate
151	4/29/2005 11:03	BULK	120	TPS-08D		31.14	duplicate
147	4/29/2005 10:43	BULK	120	TPS-10		14.18	replicate
148	4/29/2005 10:47	BULK	120	TPS-10R		2.86	replicate

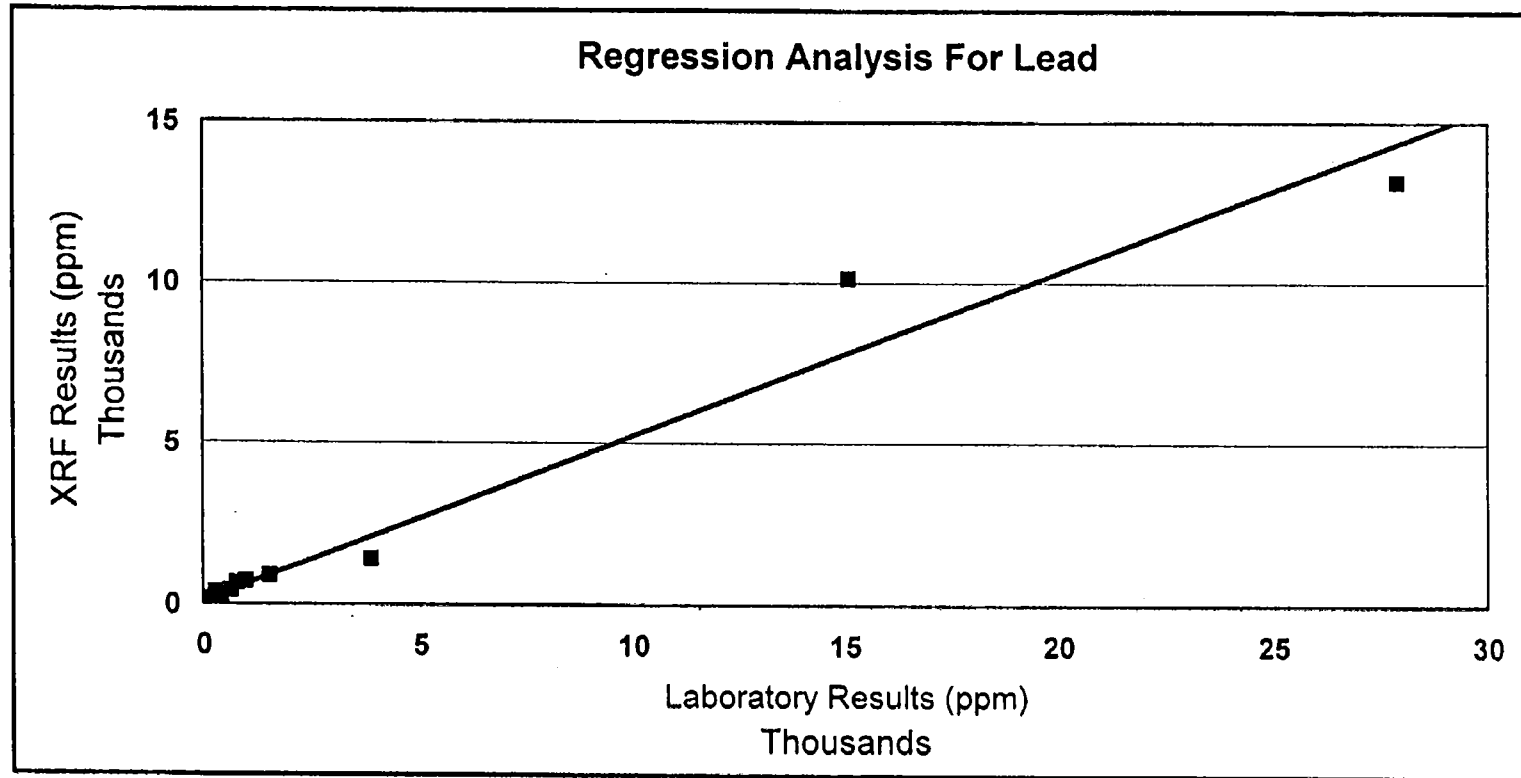
Table 9 Lead Regression Analysis
XRF Results vs Laboratory Results
Matteo Iron and Metal

Sample ID	Lab Lead	XRF Lead	XRF Data Qualifier	RPD
MIM-SO-001	153	130.93		15.5
MIM-SO-002	27,900	13,173.35		71.7
MIM-SO-003	43	31.67		30.3
MIM-SO-004	633	443.66		35.2
MIM-SO-005	15,100	10,156.38		39.1
MIM-SO-006	291	380.12		26.6
MIM-SO-007	3,850	1,413.49		92.6
MIM-SO-008	765	665.74		13.9
MIM-SO-009	183	177.34		3.1
MIM-SO-010	622	443.66		33.5
MIM-SO-012	1,520	906.16		50.6
MIM-SO-013	973	714.97		30.6
MIM-SO-014	18.1	14.18		24.3
MIM-SO-015	9.6	8.85		8.1
MIM-SO-016	161	160.54		0.3
MIM-SO-017	410	305.72		29.1
MIM-SO-018	25.2	29.59		16.0
MIM-SO-019	80.6	65.26		21.0
MIM-SO-020	93.5	100.16		6.9

Regression Output:	
Constant	125.71623
Std Err of Y Est	659.87818
R Squared	0.9686249
No. of Observations	19
Degrees of Freedom	17
X Coefficient(s)	0.5097984
Std Err of Coef.	0.022253

Average RPD 28.9

Table 9 Lead Regression Analysis
XRF Results vs Laboratory Results
Matteo Iron and Metal



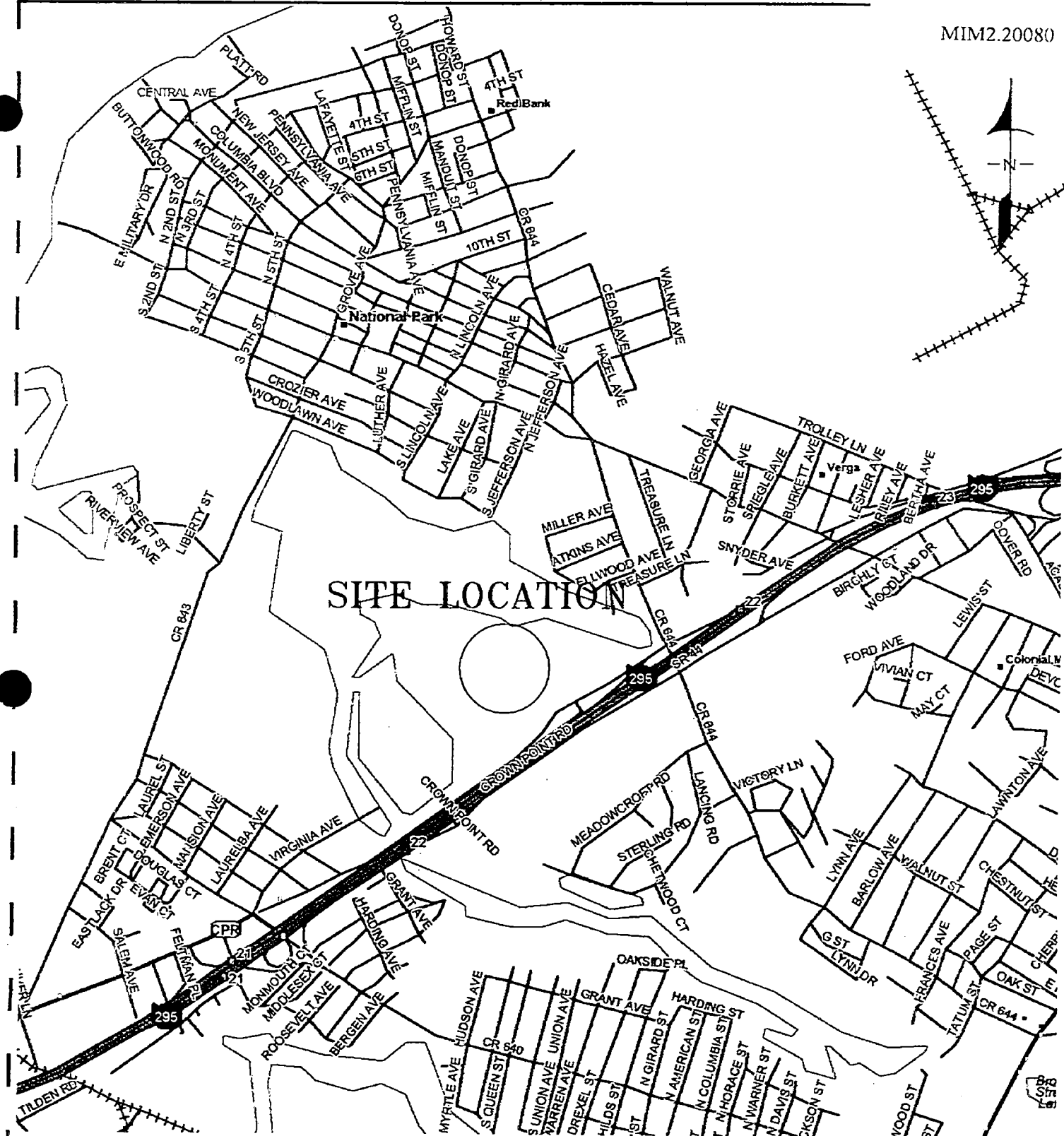


FIGURE 1
SITE LOCATION MAP
MATTEO IRON AND METAL SITE
WEST DEPTFORD, NJ

US ENVIRONMENTAL PROTECTION AGENCY

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Weston Solutions Inc.
 FEDERAL PROGRAMS DIVISION

IN ASSOCIATION WITH SCIENTIFIC ENVIRONMENTAL ASSOCIATES, INC.
 TERRANEARPMG,
 AND INNOVATIVE TECHNOLOGICAL SOLUTIONS INC.

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APPENDIX 1

NITON XLi/XIT 700 SERIES INSTRUMENTS

Elemental Limits of Detection in Soils, mg/kg (ppm)

NITON® XLi/XLt 700 Series Instruments

Elemental Limits of Detection in Soils, mg/kg (ppm)

NITON's XLi/XLt 700 Series environmental analyzers offer analytical performance that is unsurpassed in the industry. Various excitation options, including the high performance 40mCi ^{109}Cd and the x-ray tube, are available depending on your particular analytical requirements. The following chart details the sensitivity (LOD) of our XLi 732 analyzer equipped with the 40mCi ^{109}Cd , along with the ^{241}Am isotope and ^{55}Fe isotope, versus that of our XLt 792 equipped with the miniaturized x-ray tube.

These LOD's are specified for both a SiO (sand) matrix and a typical soil matrix represented by NIST Standard Reference Materials (SRM). The SRM matrix represents the closest matrix to what would be considered a "real world" soil sample. NITON specifies detection limits following the EPA protocol of 99.7% confidence level. Individual LOD's improve as a function of the square root of the testing time.

XLi/XLt 700 Series Analyzers — 60 Second Measurement Time

	^{109}Cd Isotope (40mCi)		Miniaturized X-ray Tube	
	Sand Matrix	SRM Matrix	Sand Matrix	SRM Matrix
Cr	115	160	250	350
Mn	60	230	150	250
Fe	100	230	150	250
Co	50	230	30	200
Ni	75	75	60	100
Cu	50	75	100	125
Zn	30	60	40	75
As	10	12	10	15
Se	7	10	10	15
Pb	12	15	12	20
Hg	15	18	12	20
Rb	5	7	5	15
Sr	10	15	15	25
Zr	5	18	X	X
Mo	5	7	X	X

^{241}Am Isotope (14mCi)			
Cd	35	50	30
Ag	190	130	30
Ba	35	80	X
Sn	140	180	50
Sb	65	35	50

^{55}Fe Isotope (20mCi)	
V	120
Ti	350
Ca	0.15%
K	0.35%

XRF limits of detection (LOD's) are dependent on the following factors:

- 1) Testing time
- 2) Soil matrix
- 3) Level of statistical confidence
- 4) Excitation Source

Please Note

Ongoing research and advancements in our XLi/XLt Series analyzers will lead to continual improvement in many of the values detailed in this chart. Please contact NITON or your local NITON representative for the latest performance specifications.

❖ Different instrument configurations offer varying advantages in analytical capability for specific elements, long-term cost-of-ownership and in regulatory requirements. Please contact NITON or your NITON representative to discuss which analyzer configuration will best fit your application and analytical needs.

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APPENDIX 2

EPA/REAC SOP # 1700 Niton XL722S Field Portable X-Ray Fluorescence Operating Procedure (Draft)



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NITON XL722S FIELD PORTABLE X-RAY FLUORESCENCE OPERATING PROCEDURE

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1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to serve as a guide to the start-up, check out, operation, calibration, and routine use of the NITON XL722S field portable x-ray fluorescence instrument for field use in screening hazardous or potentially hazardous inorganic materials. It is not intended to replace or diminish the use of the NITON-300series & 700series User's Guide. The User's Guide contains detailed information for optimizing instrument performance and for utilizing different applications.

The procedures contained herein are general operating guidelines which may be changed as required, depending on site conditions, equipment limitations, limitations imposed by Quality Assurance/Quality Control (QA/QC) procedures or other protocol limitations. In all instances, the procedures finally employed should be documented and included in the final report.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

1.1 Principles of Operation

X-ray Fluorescence (XRF) spectroscopy is a non-destructive, qualitative and quantitative analytical technique used to determine the chemical composition of samples. In a source excited XRF analysis, primary X-rays emitted from a sealed radioisotope source are utilized to irradiate samples. During interaction with samples, source X-rays may either undergo scattering (dominating process) or absorption by sample atoms in a process known as the photoelectric effect (absorption coefficient). This phenomenon originates when incident radiation knocks out an electron from the innermost shell of an atom creating a vacancy. The atom is excited and releases its surplus energy almost instantly by filling the vacancy with an electron from one of the higher energy shells. This rearrangement of electrons is associated with the emission of X-rays characteristic (in terms of energy) of the given atom. This process is referred to as emission of fluorescent X-rays (fluorescent yield). The overall efficiency of the fluorescence process is referred to as excitation efficiency and is proportional to the product of the absorption coefficient and the fluorescent yield.

1.1.1 Characteristic X-rays

The NITON XL722S utilizes characteristic X-ray lines originating from the innermost shells of the atoms: K, L, and occasionally M. The characteristic X-ray lines of the K series are the most energetic lines for any element and, therefore, are the preferred analytical lines. The K lines are always accompanied by the L and M lines of the same element. However, with energies much lower than those of the K lines, they can usually be neglected for those elements for which the K lines are analytically useful. For heavy elements such as cerium (Ce) (atomic number, $Z=58$), to uranium (U, $Z=92$), the L lines are the preferred lines for analysis. The L_{α} and L_{β} lines have almost equal intensities, and the choice of one or the other



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depends on what interfering lines might be present. A source just energetic enough to excite the L lines will not excite the K lines of the same element. The M lines will appear together with the L lines.

The NITON User's Guide contains information about the X-rays (K or L) and elements that are measured for each excitation source.

An X-ray source can excite characteristic X-rays from an element only if the source energy is greater than the absorption edge energy for the particular line group of the element (e.g., K absorption edge, L absorption edge, M absorption edge). The absorption edge energy is somewhat greater than the corresponding line energy. The K absorption edge energy is approximately the sum of the K, L, and M line energies, and the L absorption edge energy is approximately the sum of the L and M line energies of the particular element.

Energies of the characteristic fluorescent X-rays are converted (within the detector) into a train of electric pulses, the amplitudes of which are linearly proportional to the energy. An electronic multichannel analyzer measures the pulse amplitudes, which is the basis of a qualitative X-ray analysis. The number of counts at a given energy is representative of element concentration in a sample and is the basis for quantitative analysis.

1.1.2 Scattered X-rays

The source radiation is scattered from the sample by two physical processes: coherent or elastic scattering (no energy loss), and Compton or inelastic scattering (small energy loss). Thus, source backscatter (background signal) consists of two components with X-ray lines close together. The higher energy line is equal to the source energy. Since the whole sample takes part in scattering, the scattered X-rays usually yield the most intense lines in the spectrum. Furthermore, the scattered X-rays have the highest energies in the spectrum and, therefore, contribute most of the total measured intensity signal.

1.2 Sample Types

Solid and liquid samples may be analyzed with the NITON XL722S for elements potassium (K) through uranium (U) with proper X-ray source selection, application setup, measurement conditions, and instrument calibration. Typical environmental applications are:

- Heavy metals in soil (in-situ or samples collected from the surface or from bore hole drillings, etc.), sediments, and sludges
- Heavy metal air particulates collected on membrane filters, either from personnel samplers



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or from high volume samplers.

• Lead (Pb) in paint

2.0 METHOD SUMMARY

The NITON XL722S Portable XRF Analyzer employs two radioactive isotope sources: cadmium-109 (Cd-109) and americium-241 (Am-241) for the production of primary X-rays. Each source emits a specific set of primary X-rays which excite a corresponding range of elements in a sample. When more than one source can excite the element of interest, the appropriate source is selected according to its excitation efficiency for the element of interest. Each NITON XL722S analyzer will be configured with the appropriate sources depending on the applications provided with the unit.

The sample is positioned in front of the source-detector window and sample measurement is initiated, which exposes the sample to primary radiation from the source. Fluorescent and backscattered X-rays from the sample enter through the detector window and are counted in the high-performance, solid-state detector.

Elemental concentrations are computed based on ratios of analyte X-ray intensity to source backscatter. The raw ratios are corrected for spectral overlap and interelement effects utilizing correction coefficients and iteratively computed element concentrations. The NITON XL722S is factory calibrated, and the menu-driven software supports multiple calibrations called "applications." Each application is a complete analysis configuration including elements to be measured, interfering elements in the sample, and a set of calibration coefficients.

Measurement time is user controlled. Shorter measurement times (30 - 60s) are generally used for initial screening and hot spot delineation, while longer measurement times (60 - 300s) are typically used for higher precision and accuracy requirements.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

This SOP specifically describes operating procedures for the NITON XL722S; hence, this section is not applicable to this SOP.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The total method error for XRF analysis is defined as the square root of the sum of squares of both instrument precision and user or application related error. Generally, the instrument precision is the least significant source of error in XRF analysis. User or application related error is generally more significant and will vary with each site and method used. The components of the user or application related error are the following.



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4.1 Sample Placement

This is a potential source of error because the X-ray signal decreases as the distance from the radioactive source is increased. However, this error is minimized by maintaining the same distance for each sample. Sample geometry with respect to the source/detector is also important. A tilted sample may cause analytical error. The NITON XL722S ratios analyte X-ray lines to source backscatter, which minimizes this type of error.

4.2 Sample Representivity

In order to accurately characterize site conditions, samples collected must be representative of the site or area under investigation. Representative soil sampling ensures that a sample or group of samples accurately reflects the concentration of the contaminant(s) of concern at a given time and location. Analytical results from representative samples reflect the variation in pollutant presence and concentration range throughout a site. Variables affecting sample representativeness include: (1) geologic variability, (2) contaminant concentration variability, (3) collection and preparation variability, and (4) analytical variability. Attempts should be made to minimize these sources of variability. For additional information on representative sampling, refer to the "Removal Program Representative Sampling Guidance, Volume I - Soil."⁽¹⁾

4.3 Reference Analysis

Soil chemical and physical matrix effects may be corrected (to some extent) by adjusting XRF results (via regression) using site-specific soil samples which have been analyzed by Inductively-Coupled Plasma (ICP) or Atomic Absorption (AA) spectroscopy methods. A major source of error can result if these samples are not representative of the site and/or if the analytical error is large. Additionally, when comparing XRF results with reference analyses results, the efficiency of the sample digestion reference analysis should be considered. Some digestion methods may breakdown different sample matrices more efficiently than others.

4.4 Chemical Matrix Effects

Chemical matrix effects result from differences in concentrations of interfering elements. These effects appear as either spectral interferences (peak overlaps) or as X-ray absorption/enhancement phenomena. Both effects are common in soils contaminated with heavy metals. For example, iron (Fe) tends to absorb copper (Cu) X-rays, reducing the intensity of Cu measured by the detector. This effect can be corrected mathematically through the use of interelement correction coefficients.

4.5 Physical Matrix Effects



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Physical matrix effects are the result of variations in the physical character of the sample. They include parameters such as particle size, uniformity, homogeneity, and surface condition. For example, consider a sample in which the analyte exists in the form of very fine particles within a matrix composed of much coarser material. If two separate aliquots of the sample are prepared in such a way that the matrix particles in one are much larger than in the other, then the relative volume of analyte occupied by the analyte-containing particles will be different in each. When measured, a larger amount of the analyte will be exposed to the source X-rays in the sample containing finer matrix particles; this results in a higher intensity reading for that sample and, consequently, an apparently higher measured concentration for that element.

4.6 Application Error

Generally, the error in the application calibration model is insignificant (relative to the other sources of error) **PROVIDED** the instrument's operating instructions are followed correctly. However, if the sample matrix varies significantly from the design of the application, the error may become significant (e.g., using the Bulk Sample [soils] application to analyze a 50 percent iron mine tailing sample).

4.7 Moisture Content

Sample moisture content affects the analytical accuracy of soils or sludges. The overall error may be secondary when the moisture range is small (5-20 percent), or it may be a major source of error when measuring the surface of soils that are saturated with water. (NOTE: attempting an in-situ measurement on a saturated soil may damage the instrument.)

4.8 Cases of Severe X-ray Spectrum Overlaps

When present in the sample, certain X-ray lines from different elements can be very close in energy and, therefore, can interfere by producing a severely overlapped spectrum.

Typical spectral overlaps are caused by the K_{α} line of element Z-1 (or as with heavier elements, Z-2 or Z-3) overlapping with the K_{α} line of element Z. This is the so-called K_{α}/K_{α} interference. Since the K_{α}/K_{α} intensity ratio for the given element usually varies from 5:1 to 7:1, the interfering element, Z-1, must be present in large concentrations in order to affect the measurement of analyte Z. For example, the presence of large concentrations of iron (Fe) could affect the measurement of cobalt (Co). The Fe K_{α} and K_{β} energies are 6.40 and 7.06 KeV, respectively. The Co K_{α} energy is 6.93 KeV. The resolution of the detector is approximately 300 eV. Therefore, large amounts of Fe in a sample will result in spectral overlap of the Fe K_{β} with the Co K_{α} peak (see Figure 1, Appendix A) and the resultant X-ray spectrum will include TOTAL counts for Fe plus Co lines.

Other interferences arise from K/L, K/M, and L/M line overlaps. While these are less common, the



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following are examples of severe overlap:

As K_{α} /Pb L_{α} , Ti K_{α} /Ba L_{α}

In the arsenic (As)/lead case, Pb can be measured from the Pb L_{α} line, and arsenic from either the As K_{α} or the As K_{β} line; this way the unwanted interference can be corrected. However, due to the limits of mathematical corrections, measurement sensitivity is reduced. Generally, arsenic concentrations can not be efficiently calculated in samples with Pb:As ratios of 10:1 or more. This may result in zero arsenic being reported regardless of what the actual concentration is.

The NITON XL722S uses overlap factors to correct for X-ray spectral overlaps for the elements of interest for a given application.

5.0 EQUIPMENT / APPARATUS

5.1 Description of the NITON XL722S System

The NITON XL722S is a complete, hand-held, portable XRF analyzer weighing less than three pounds. It utilizes the method of Energy Dispersive X-Ray Fluorescence (EDXRF) spectroscopy to determine the elemental composition of soils, sludges, particulate, paint, and other waste materials.

The NITON XL722S analyzer includes two compact, sealed radiation sources: Cd-109 and Am-241. The user selects the source and the analyzer software reports concentrations based on stored information for each application. Measurement time is user determined. The NITON XL722S utilizes a high performance, electrically-cooled, solid-state detector optimized for L-shell and K-shell X-ray detection.

The unit provides internal non-volatile memory for storage of 1000 bulk and/or thin sample spectra and multi-element analysis reports, or up to 3000 paint-mode test results. A RS-232 serial port is provided for downloading results and spectra to a PC. The multi-element analysis reports and spectra can be displayed on the instrument's display screen. ~~The replaceable and rechargeable Nickel Metal Hydride battery pack provides for field portable operation.~~

The NITON XL722S is supplied with one or more applications. The "Bulk Sample" (soil samples) application is for analysis of up to 25 metals, where the balance of the sample (that portion not directly measured by the instrument) is essentially silica (SiO_2). The "Thin Sample" application is for analysis of thin films such as air monitoring filters or wipes. The "Lead Based Paint" application is for analyzing Pb in paint films. NITON LLC will also develop new applications to meet user specific requirements (e.g., adding elements to the "Soil Samples" application).



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~~The NITON XL722S is powered from its 8-hour capacity battery. The manufacturer's operating condition specifications are: Temperature range 20 to 120° Fahrenheit (F), Humidity range 0 to 95%.~~

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5.2 Equipment and Apparatus List

5.2.1 NITON XL722S Analyzer System

The complete NITON XL722S Analyzer System includes:

- Hand-held analyzer unit for data acquisition, processing, and display. Includes: high-performance, solid-state detector, two excitation sources (Cd-109, Am-241), data processing software, and control panel/results display.
- RS-232C Serial I/O Interface cable
- Silicon dioxide (SiO₂) blank check sample
- Three NIST soil SRMs: 2709, 2710, and 2711, and one RCRA check sample
- Battery charger
- Two battery packs
- System carrying/shipping case and field carrying case/holster
- Soil sample analysis/preparation accessories in separate carrying/shipping case
- NITON XL722S User's Guide and NITON Xtras PC utilities software.

5.2.2 Optional Items

- 31-mm diameter sample cups
- XRF polypropylene film, 0.2 mil thick
- Windows 2000 based Personal Computer (PC)
- Spare battery packs and spare charger



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See the NITON XL722S Accessories List for additional options.

For mobile, lab or laboratory X-ray sample preparation accessories (such as drying ovens, grinders, sieves, etc.), consult general laboratory equipment suppliers.

5.3 Peripheral Devices

The NITON XL722S may be used with a PC to download results/spectra, and for customized reports.

5.3.1 Communication Cable Connection

Plug the round end of the RS-232 Serial I/O cable into the NITON XL722S connector (the connection left of the on/off/reset switch) and the 9-pin connector of the cable into the serial port of the PC.

5.3.2 NITON Xtras 5.7e Software

The PC must be running the NITON XTras v5.7e software to communicate with the NITON XL722S. The XTras software allows you to select various configurations for downloading, exporting, displaying, and reporting results/spectra. Refer to the NITON User's Guide and XTras Quickstart Guide for details.

6.0 REAGENTS

Generally, soil calibration standards are not necessary for site screening and extent of contamination analyses with the NITON XL722S. The unit's performance can be verified by analyzing the NIST soil SRMs provided with the unit. Refer to the NITON User's Guide for chemical composition of the NIST SRMs.

7.0 PROCEDURE

7.1 Operation

Refer to the NITON User's Guide for detailed instrument operating procedures and screen illustrations.

7.1.1 Startup

To remove the battery, loosen the two screws on the end of the unit below the on/off/reset switch and gently lift the battery pack away from the connector on the unit's base. Insert a fresh battery pack and tighten the set screws.



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Apply power to the NITON by sliding the on/off/reset switch to the on position. Sometimes the instrument's battery saving features momentarily delay startup. If the NITON does not turn on immediately, turn it off, wait a few seconds, and turn it on again. Each time the NITON is turned on, the Main Menu appears and the screen arrow points to Calibrate & Test.

Allow the NITON to warm up for a minimum of 15 minutes after it has been turned on before performing analysis.

7.1.2 Precautions

The NITON XL722S should be handled in accordance with the following radiological control practices.

Refer to the NITON User's Guide for detailed discussion of Radiation Safety practices.

1. The NITON XL722S should always be in contact with the surface of the material being analyzed, and that material should completely cover the aperture when the sources are exposed. Do not remove a sample or move the unit while the shutter is open.
2. When the sources are exposed, under no circumstances should the NITON XL722S be pointed at the operator or surrounding personnel.
3. Do not place any part of the operator's or co-worker's bodies in line of exposure when the sources are exposed or partially covered.
4. The shutter must be closed with the shutter safety lock engaged when not in use.
5. The manufacturer (NITON LLC) must be notified immediately of any condition or concern relative to the NITON XL722S's structural integrity, source shielding, source switching condition, or operability.
6. The appropriate state agency or the Nuclear Regulatory Commission (NRC) office must be notified immediately of any damage to the radioactive source, or any loss or theft of the device (see factory supplied data on radiological safety).
7. Labels or instructions on the NITON XL722S(s) must not be altered or removed.
8. The user must not attempt to open the unit.



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9. The source(s) in the unit must be wipe-tested every 6 months as described in the NITON XL722S User's Guide. The leak test certificates must be kept on file, and a copy must accompany the instrument at all times.
10. The bulk test platform or equivalent sample stage provided by NITON LLC must be used whenever the NITON XL722S is used for measuring samples contained in cups.
11. The NITON XL722S should not be dropped or exposed to conditions of excessive shock or vibration.

Additional precautions include:

1. The NITON XL722S should always be stored in its waterproof, drop-proof carrying case.
2. The battery charging unit should only be used in dry conditions.
3. Battery packs should be changed only in dry conditions.

7.2 Control Panel and Menu Software

This section outlines the control panel buttons and basic menu software. Detailed illustrations of the control panel and screen displays are in the NITON User's Guide.

7.2.1 Control Panel Buttons

The NITON control panel consists of three buttons; Clear/Enter, right arrow (->), and left arrow (<-). These buttons allow the operator to navigate all the NITON screens and menus. The amount of time that the button is held down also controls the function of the buttons. Pressing the Clear/Enter button briefly (less than 1 second) or pressing the right (->) or left (<-) arrow buttons scrolls through the listed items shown on the screen. Holding down the Clear/Enter button for a longer period (more than 3 seconds) activates a different screen.

7.2.2 The Setup Menu

The Setup Menu is used to check instrument specifications, to set date and time, to illuminate the screen continuously, or to select a different testing mode. Once set up, this screen will remain the same each time the NITON is turned on until it is reset. To activate,



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select Setup Menu from the Main Menu with the arrow buttons and press the Clear/Enter button to enter the Setup Menu. Refer to the NITON User's Guide for detailed instructions on using the Setup Menu.

7.2.3 Calibrate & Test

When the screen arrow (->) is on Calibrate & Test, press the Clear/Enter button to start the self-calibration process. This process calibrates detector energy gain/zero so that analyte X-rays are in their proper spectral location. Self-calibration takes about one to two minutes. When it is complete, the instrument will beep and the Ready to Test screen will appear. The self-calibration process should be performed every 1-2 hours during sample analysis to maintain proper detector calibration.

7.2.4 The Ready to Test Screen

This screen displays: the current date and time, the instrument serial number, the indication that the instrument is ready to test, the testing mode, the action level for "positive" or "negative" determination of lead in paint (lead based paint application only), the detector energy resolution, and the source strength.

CAUTION: Check the date and time. If they are not correct, reset them before taking any measurements (see NITON User's Guide). Readings will not be accurate unless date and time are correct.

7.2.5 The Measurement Screen

The highest concentration elements are displayed in ppm (with the two-sigma confidence intervals) on the first measurement screen. The test time is also displayed.

7.2.6 The Summary Screen

When the operator ends a reading, the Measurement Screen is replaced by the Summary Screen. Results are displayed for 14 elements on NITON XL700 series models. These are divided into two groups: detected elements, and elements that were not detected. Press the arrow buttons to scroll through the element list. An element is classified detected when the measured concentration (ppm) is at least 1.5-times the confidence interval (ie, 3-sigma). Detected elements are displayed as in the Measurement Screen. Non-detected elements are shown as "< xx", where xx is the three-sigma instrument detection limit for that sample. The instrument detection limit (3-sigma) for each element is calculated for each sample.



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7.3 Preoperational Checks

7.3.1 Energy Calibration

An energy calibration (Calibrate & Test) should be performed as required to ensure proper energy calibration (eg, after an instrument is shipped). The Calibrate & Test function is located in the Main Menu (see section 7.2.3).

7.3.2 Resolution Check

The resolution check examines the detector's ability to resolve X-ray energies. This should be performed once at the beginning of the day. Record/document the Energy Resolution in the Ready to Test screen (after Calibrate & Test). The value should not vary significantly from day to day and should typically be less than 400 eV. If the unit fails to meet this specification, call NITON LLC for assistance.

7.3.3 Blank (Zero) Sample Check

The blank (Zero) sample check is performed to monitor the instrument's zero drift in the selected application. The blank sample check only applies to the application (test mode) currently selected. This should be done once at the beginning of the day, after Calibrate & Test, after selecting a test mode, and whenever the instrument exhibits a persistent drift on a blank or low-level sample.

Load the SiO₂ Blank (supplied with the NITON unit) in the NITON Bulk Sample Test Platform. Analyze for 60 seconds (source seconds) with each source in the unit. Review results. All elemental results should be reported as non-detected (<xx, where xx is the 3-sigma instrument detection limit). Repeat the measurement if the unit fails to meet these specifications. If several elements continue to be significantly out of these specifications, check the plastic window and the blank sample for contamination. Perform the blank (Zero) sample check again. Save the results/spectra for documentation.

7.3.4 Target Element Response Check

The purpose of the target element response check is to ensure that the instrument and the selected application are working properly prior to performing sample analysis. This check should be performed at the beginning of the day. Use the NIST SRM 2709, 2710, and 2711 standards provided with the NITON unit to check the Soil Samples application. These samples should be measured using the same source acquisition times that will be used for sample analysis. Save the sample check results/spectra for documentation.



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7.4 Source Measuring Time

The source measuring time is user controlled. Generally, the element detection limit is reduced by 50 percent for every four-fold (x4) increase in source measuring time. Although counting statistics improve as measurement time increases, the practical upper limit for typical applications is about 300 seconds.

The NITON XL700 units measure time in "source seconds". This includes an automatic correction for source decay so that 60 source seconds will have a constant precision regardless of source age. The correction extends measurement time to correct for source strength lost through the decay process.

A minimum measuring time of 60 source seconds for each source is recommended when using the Soil Samples application. Measuring times for a source that excites a target element can be increased if lower detection limits are required.

7.5 Sample Handling and Presentation

When making XRF measurements, be sure to maintain constant measurement geometry in order to minimize variations in analysis results. Document any anomalies in measurement geometry, sample surface morphology, moisture content, sample grain size, and matrix (see Section 4.0).

7.5.1 Soil Samples

Soil samples may be analyzed either in-situ or in XRF sample cups (after preparation). The Soil Samples application assumes the sample to be infinitely thick. For in-situ measurements this is the case, however, for sample cup measurements it is advisable to fill the cup nearly full and use the supplied paper disk and cotton ball to hold the sample firmly against the sample cup window. This ensures that the sample is as uniformly thick as possible from analysis to analysis. The NITON XL722S bulk sample test platform or equivalent bulk sample platform provided by NITON must be used when analyzing sample cups.

~~Analysis for in-situ analysis should be prepared by removing large rocks and debris. The soil surface should be flat and compact prior to analysis.~~ The NITON XL722S should be placed in its' in-situ adaptor and held firmly on the ground to maximize contact with the ground. The unit should not be moved during analysis. ~~Analysis of water saturated soils should be avoided.~~ Use of varying thicknesses of plastic (bags) have been shown to interfere with light element (low atomic number) measurements and may affect the calculation of the other element concentrations.⁽²⁾ Additionally, plastic may contain significant levels of target element contamination. The NITON XL722S ratios analyte line intensity to that from source



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backscatter and, therefore, may be less susceptible to bag thickness effects. Refer to the NITON User's Guide for details on analyzing Soil Samples (Bulk Samples).

~~Coarse grained soil conditions or bags of contaminated material may not provide a truly representative sample and adversely affect the analysis results (typically by under reporting the target elements). Such samples should be prepared before analysis. Preparation consistency is important to minimize variation in analytical results.~~

This application is designed for soil with the assumption that the balance of the material is essentially silica. If samples with a much lighter (lower atomic number) balance are analyzed, the results may be elevated by a factor of two to four. Contact NITON LLC for help in analysis of different matrices.

7.5.2 Thin (Filter) Samples

The Thin Samples application is for analysis of thin samples such as particulates on filters or wipes. The detection limits are affected by the thickness of the substrate. Best results are obtained on the thinnest substrates. Always use the Dust wipe and Filter Test platform when measuring thin samples. This is not only for user safety, but also ensures a controlled environment to facilitate testing thin samples. ~~Contaminated material captured on filters or wipes is not usually deposited uniformly. Therefore, to produce meaningful results, several readings must be taken for each thin sample measurement.~~ The average or sum of these readings is the reported value for the measurement. Refer to the NITON User's Guide for details on analyzing Thin Samples.

7.5.3 Lead in Paint

To analyze for lead in paint on a surface (eg, wall, counter, etc.), the area selected for analysis should be smooth, representative and free of surface dirt. The NITON XL722S should be held firmly on the surface to maximize contact. The probe should not be moved during analysis. Refer to the NITON User's Guide for details on analyzing lead paint samples.

7.6 Downloading Stored Results and Spectra

Results (analytical reports) and spectra which have been stored in the NITON XL722S internal memory should be downloaded and captured in disk files on a PC (see section 5). NITON LLC provides software (Xtras 5.7e) for this purpose. Additionally, results or spectra may be exported to text files for importing into a spreadsheet. Refer to the instructions provided with the programs for details on their operation.



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After capturing results to a file, print a copy and save both the disk files and the printout for future reference and documentation purposes.

7.7 Instrument Maintenance

NOTE: All service except exterior cleaning must be performed by NITON LLC. Do not attempt to make repairs yourself. Opening the case of the NITON will void the Warranty.

7.7.1 Exterior Cleaning

When the Kapton plastic window on the bottom of the instrument becomes dirty, the performance of the NITON unit will be affected. ~~Clean the window gently with cotton swabs. Clean the instrument's metal case with a soft cloth. Never use water, detergents, or solvents. These may damage the instrument.~~

7.7.2 Further Information and Troubleshooting

Refer to the NITON XL722S User's Guide for additional detailed operational and/or maintenance and troubleshooting instructions. If no solution is found in the manual, contact NITON LLC for assistance.

An instrument log should be maintained to document specific corrective actions taken to alleviate any instrumental problems, or for recording any service that has been performed.

8.0 CALCULATIONS

The NITON XL722S is a direct readout instrument that does not require any external calculations.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

9.1 Precision

The precision of the method is monitored by reading a low- or mid-target element concentration sample (eg, a SRM or the NITON RCRA sample) at the start and end of sample analysis and after approximately every tenth sample. Determining the precision around the site action level can be extremely important if the XRF results are to be used in an enforcement action. Therefore, selection of a sample with a target element concentration at or near the site action level or level of concern is recommended. The sample is analyzed by the instrument for the normal field analysis time, and the results are recorded. A minimum of seven measurements should be made during field activities. The standard deviation for each target element is calculated. The relative standard deviation (RSD) of the sample mean can be used to calculate precision. The RSD should be within ± 20 percent.⁽³⁾



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9.2 The Method Detection Limit (MDL) and Method Quantitation Limit (MQL)

The MDL and MQL may be calculated from the measurement of either a low or blank sample (or a SRM) at the start and end of sample analysis, and after approximately every tenth sample. Alternatively, the SiO₂ blank or "clean" sand may be used if a blank soil or sediment sample is unavailable.

Measure the MDL sample using the same application and measuring time used for routine samples. A minimum of seven measurements should be made during field activities. Calculate the sample standard deviation of the mean for each target element, and round up to the next whole number prior to calculating the MDL and MQL.

The definition of the MDL is three times the calculated standard deviation value. The definition of the MQL is 10 times the calculated standard deviation value.

9.3 Reporting Results

All raw XRF data should be recorded including the individual results of multiple analyses of samples and sampling points. The average and concentration range of each multiple analysis should also be reported.

A "reported" value for each analysis or average of multiple analyses should be processed in the following manner.

1. Round the value to the same degree of significance contained in the calibration or check standard sample assay values (usually two). Round to 2 significant figures for sample results. DO NOT round results for standards used to determine MDL or RSD values (use raw data).
2. Report all values less than the MDL as not detected (U).
3. OPTIONAL: Flag and note all values greater than or equal to the MDL and less than the MQL (usually with a "J" next to the reported value).
4. Report all values equal to or greater than the MDL and within the linear calibration range.

9.4 Accuracy

Accuracy, relative to a specific digestion method and elemental analysis procedure, is determined by submitting a sample analyzed by XRF methods (prepared sample cups may be submitted) for confirmatory AA or ICP analysis at a laboratory.

The on-site analysis of soils by portable XRF instrumentation should be considered a screening effort



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only (DC1 data). Data derived from the instrument should be used with discretion. Confirmatory analyses on a subset of the screening samples (minimum 10 percent) can be used to determine if the XRF data meets DC2 data objectives. The confirmation samples should ideally be selected randomly from the sample set and include a number of samples at or near the critical level. The results of the laboratory analysis (dependent) and the XRF analysis (independent) are evaluated with a regression analysis. The coefficient of determination (r^2) should be 0.7 or greater.⁽³⁾

Correcting the XRF results based on confirmatory analyses should only be undertaken after careful consideration. The confirmatory analysis (AA or ICP) is an estimate of the concentration of metal contamination and is dependent upon the digestion method and sampling methodology used. Since XRF is a total elemental technique, any comparison with referee results must account for the possibility of variable extraction efficiency, dependent upon the digestion method used and its ability to dissolve the waste or mineral form in question.

9.5 Matrix Considerations

Other types of QA/QC verification should include verification that the instrument calibration is appropriate for the specific site to be assessed. This includes verification of potential multiple soil matrix types that may exist at a site. Matrix differences which affect the XRF measurement include large variations in calcium content, which may be encountered when going from siliceous to calcareous soils, as well as large variations in iron content.

10.0 DATA VALIDATION

10.1 Confirmation Samples

~~Confirmation samples should be selected at a minimum rate of 10 percent and be representative of the sample set.~~ Ideally, the sample cup that was analyzed by XRF should be the same sample that is submitted for AA/ICP analysis. When confirming an in-situ analysis, collect a sample from a 6-inch by 6-inch area for both an XRF measurement and confirmation analysis.

The XRF and confirmatory AA/ICP results are analyzed with a regression analysis using a statistical program (such as SAS®) or a spreadsheet with the intercept calculated in the regression. The coefficient of determination (r^2) between XRF and AA/ICP data must be 0.7 or greater for DC2 data objectives.⁽³⁾

10.2 Recording Results

Record all results and monitoring activities in a laboratory or field notebook. Also, results may be recorded electronically on a hard drive or floppy disk.

11.0 HEALTH AND SAFETY



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When working with potentially hazardous materials, follow U.S. EPA, OSHA, corporate and/or any other applicable health and safety practices.

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APPENDIX A
Figures
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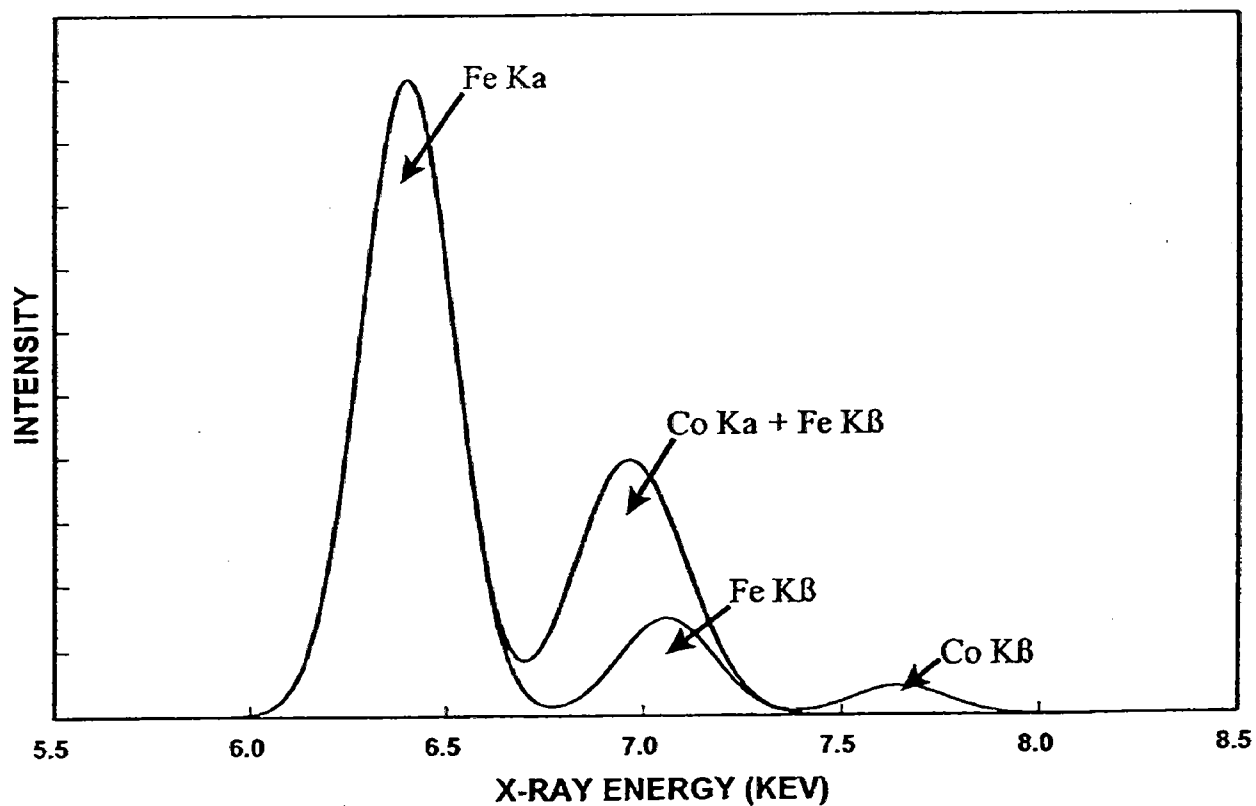
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FIGURE 1. X-Ray Spectral Plot, Showing Overlap of Iron K_{β} X-Rays in the Cobalt K_{α} Measurement Region.

X-RAY SPECTRAL OVERLAP





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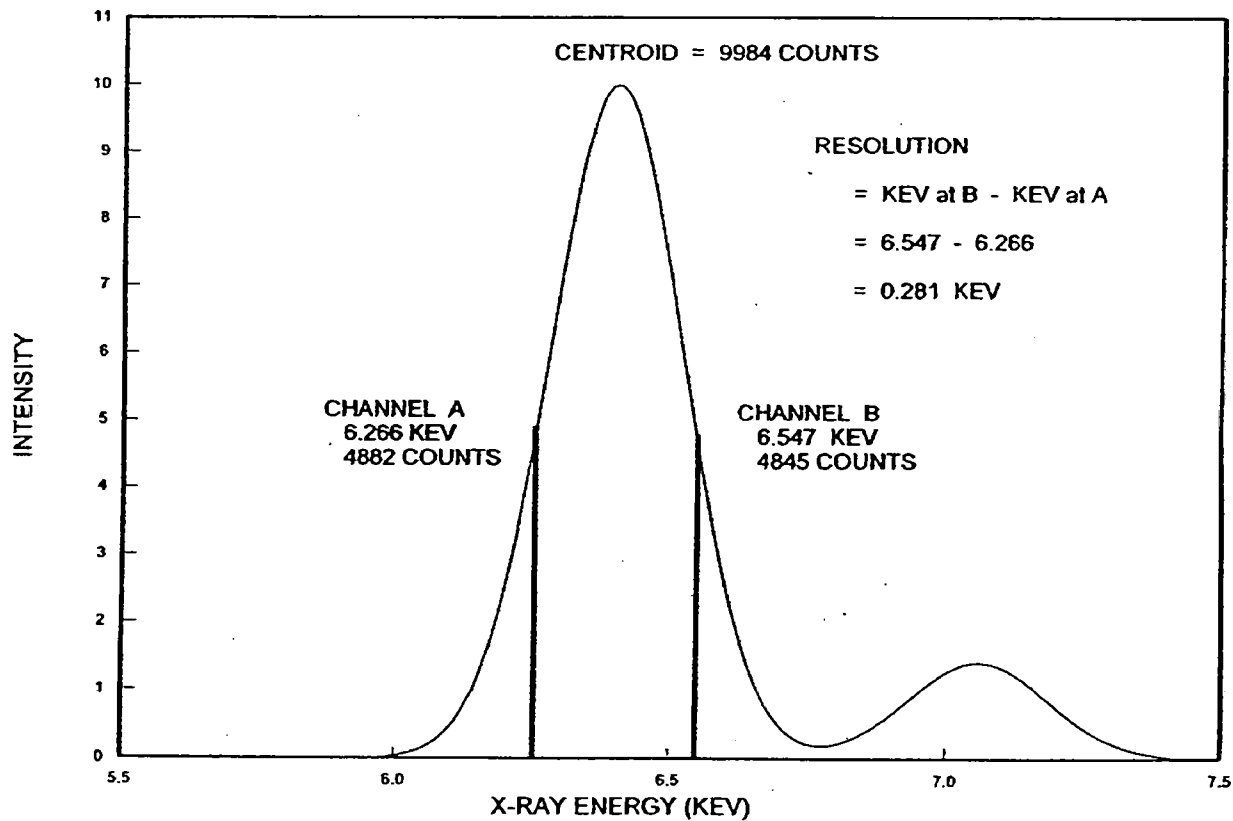
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FIGURE 2. Iron X-Ray Spectrum Illustrating Detector Resolution

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DETECTOR RESOLUTION



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APPENDIX 3

EPA TEST METHOD 6200

**Field Portable X-Ray Fluorescence Spectrometry For The Determination
Of Elemental Concentrations In Soil And Sediment**

METHOD 6200

FIELD PORTABLE X-RAY FLUORESCENCE SPECTROMETRY FOR THE
DETERMINATION OF ELEMENTAL CONCENTRATIONS IN SOIL AND SEDIMENT

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the in situ and intrusive analysis of the 26 analytes listed in Table 1 for soil and sediment samples. Some common elements are not listed in Table 1 because they are considered "light" elements that cannot be detected by field portable x-ray fluorescence (FPXRF). They are: lithium, beryllium, sodium, magnesium, aluminum, silicon, and phosphorus. Most of the analytes listed in Table 1 are of environmental concern, while a few others have interference effects or change the elemental composition of the matrix, affecting quantitation of the analytes of interest. Generally elements of atomic number 16 or greater can be detected and quantitated by FPXRF.

1.2 Detection limits depend on several factors, the analyte of interest, the type of detector used, the type of excitation source, the strength of the excitation source, count times used to irradiate the sample, physical matrix effects, chemical matrix effects, and interelement spectral interferences. General instrument detection limits for analytes of interest in environmental applications are shown in Table 1. These detection limits apply to a clean matrix of quartz sand (silicon dioxide) free of interelement spectral interferences using long (600-second) count times. These detection limits are given for guidance only and will vary depending on the sample matrix, which instrument is used, and operating conditions. A discussion of field performance-based detection limits is presented in Section 13.4 of this method. The clean matrix and field performance-based detection limits should be used for general planning purposes, and a third detection limit discussed, based on the standard deviation around single measurements, should be used in assessing data quality. This detection limit is discussed in Sections 9.7 and 11.3.

1.3 Use of this method is restricted to personnel either trained and knowledgeable in the operation of an XRF instrument or under the supervision of a trained and knowledgeable individual. This method is a screening method to be used with confirmatory analysis using EPA-approved methods. This method's main strength is as a rapid field screening procedure. The method detection limits (MDL) of FPXRF are above the toxicity characteristic regulatory level for most RCRA analytes. If the precision, accuracy, and detection limits of FPXRF meet the data quality objectives (DQOs) of your project, then XRF is a fast, powerful, cost effective technology for site characterization.

2.0 SUMMARY OF METHOD

2.1 The FPXRF technologies described in this method use sealed radioisotope sources to irradiate samples with x-rays. X-ray tubes are used to irradiate samples in the laboratory and are beginning to be incorporated into field portable instruments. When a sample is irradiated with x-rays, the source x-rays may undergo either scattering or absorption by sample atoms. This later process is known as the photoelectric effect. When an atom absorbs the source x-rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons

results in emission of x-rays characteristic of the given atom. The emission of x-rays, in this manner, is termed x-ray fluorescence.

Three electron shells are generally involved in emission of x-rays during FPXRF analysis of environmental samples: the K, L, and M shells. A typical emission pattern, also called an emission spectrum, for a given metal has multiple intensity peaks generated from the emission of K, L, or M shell electrons. The most commonly measured x-ray emissions are from the K and L shells; only metals with an atomic number greater than 57 have measurable M shell emissions.

Each characteristic x-ray line is defined with the letter K, L, or M, which signifies which shell had the original vacancy and by a subscript alpha (α) or beta (β), which indicates the higher shell from which electrons fell to fill the vacancy and produce the x-ray. For example, a K_α line is produced by a vacancy in the K shell filled by an L shell electron, whereas a K_β line is produced by a vacancy in the K shell filled by an M shell electron. The K_α transition is on average 6 to 7 times more probable than the K_β transition; therefore, the K_α line is approximately 7 times more intense than the K_β line for a given element, making the K_α line the choice for quantitation purposes.

The K lines for a given element are the most energetic lines and are the preferred lines for analysis. For a given atom, the x-rays emitted from L transitions are always less energetic than those emitted from K transitions. Unlike the K lines, the main L emission lines (L_α and L_β) for an element are of nearly equal intensity. The choice of one or the other depends on what interfering element lines might be present. The L emission lines are useful for analyses involving elements of atomic number (Z) 58 (cerium) through 92 (uranium).

An x-ray source can excite characteristic x-rays from an element only if the source energy is greater than the absorption edge energy for the particular line group of the element, that is, the K absorption edge, L absorption edge, or M absorption edge energy. The absorption edge energy is somewhat greater than the corresponding line energy. Actually, the K absorption edge energy is approximately the sum of the K, L, and M line energies of the particular element, and the L absorption edge energy is approximately the sum of the L and M line energies. FPXRF is more sensitive to an element with an absorption edge energy close to but less than the excitation energy of the source. For example, when using a cadmium-109 source, which has an excitation energy of 22.1 kiloelectron volts (keV), FPXRF would exhibit better sensitivity for zirconium which has a K line energy of 15.7 keV than to chromium, which has a K line energy of 5.41 keV.

2.2 Under this method, inorganic analytes of interest are identified and quantitated using a field portable energy-dispersive x-ray fluorescence spectrometer. Radiation from one or more radioisotope sources or an electrically excited x-ray tube is used to generate characteristic x-ray emissions from elements in a sample. Up to three sources may be used to irradiate a sample. Each source emits a specific set of primary x-rays that excite a corresponding range of elements in a sample. When more than one source can excite the element of interest, the source is selected according to its excitation efficiency for the element of interest.

For measurement, the sample is positioned in front of the probe window. This can be done in two manners using FPXRF instruments: in situ or intrusive. If operated in the in situ mode, the probe window is placed in direct contact with the soil surface to be analyzed. When an FPXRF instrument is operated in the intrusive mode, a soil or sediment sample must be collected, prepared, and placed in a sample cup. The sample cup is then placed on top of the window inside a protective cover for analysis.

Sample analysis is then initiated by exposing the sample to primary radiation from the source. Fluorescent and backscattered x-rays from the sample enter through the detector window and are converted into electric pulses in the detector. The detector in FPXRF instruments is usually either a solid-state detector or a gas-filled proportional counter. Within the detector, energies of the characteristic x-rays are converted into a train of electric pulses, the amplitudes of which are linearly proportional to the energy of the x-rays. An electronic multichannel analyzer (MCA) measures the pulse amplitudes, which is the basis of qualitative x-ray analysis. The number of counts at a given energy per unit of time is representative of the element concentration in a sample and is the basis for quantitative analysis. Most FPXRF instruments are menu-driven from software built into the units or from personal computers (PC).

The measurement time of each source is user-selectable. Shorter source measurement times (30 seconds) are generally used for initial screening and hot spot delineation, and longer measurement times (up to 300 seconds) are typically used to meet higher precision and accuracy requirements.

FPXRF instruments can be calibrated using the following methods: internally using fundamental parameters determined by the manufacturer, empirically based on site-specific calibration standards (SSCS), or based on Compton peak ratios. The Compton peak is produced by backscattering of the source radiation. Some FPXRF instruments can be calibrated using multiple methods.

3.0 DEFINITIONS

3.1 FPXRF: Field portable x-ray fluorescence.

3.2 MCA: Multichannel analyzer for measuring pulse amplitude.

3.3 SSCS: Site specific calibration standard.

3.4 FP: Fundamental parameter.

3.5 ROI: Region of interest.

3.6 SRM: Standard reference material. A standard containing certified amounts of metals in soil or sediment.

3.7 eV: Electron Volt. A unit of energy equivalent to the amount of energy gained by an electron passing through a potential difference of one volt.

3.8 Refer to Chapter One and Chapter Three for additional definitions.

4.0 INTERFERENCES

4.1 The total method error for FPXRF analysis is defined as the square root of the sum of squares of both instrument precision and user- or application-related error. Generally, instrument precision is the least significant source of error in FPXRF analysis. User- or application-related error is generally more significant and varies with each site and method used. Some sources of interference can be minimized or controlled by the instrument operator, but others cannot. Common sources of user- or application-related error are discussed below.

4.2 Physical matrix effects result from variations in the physical character of the sample. These variations may include such parameters as particle size, uniformity, homogeneity, and surface condition. For example, if any analyte exists in the form of very fine particles in a coarser-grained matrix, the analyte's concentration measured by the FPXRF will vary depending on how fine particles are distributed within the coarser-grained matrix. If the fine particles "settle" to the bottom of the sample cup, the analyte concentration measurement will be higher than if the fine particles are not mixed in well and stay on top of the coarser-grained particles in the sample cup. One way to reduce such error is to grind and sieve all soil samples to a uniform particle size thus reducing sample-to-sample particle size variability. Homogeneity is always a concern when dealing with soil samples. Every effort should be made to thoroughly mix and homogenize soil samples before analysis. Field studies have shown heterogeneity of the sample generally has the largest impact on comparability with confirmatory samples.

4.3 Moisture content may affect the accuracy of analysis of soil and sediment sample analyses. When the moisture content is between 5 and 20 percent, the overall error from moisture may be minimal. However, moisture content may be a major source of error when analyzing samples of surface soil or sediment that are saturated with water. This error can be minimized by drying the samples in a convection or toaster oven. Microwave drying is not recommended because field studies have shown that microwave drying can increase variability between FPXRF data and confirmatory analysis and because metal fragments in the sample can cause arcing to occur in a microwave.

4.4 Inconsistent positioning of samples in front of the probe window is a potential source of error because the x-ray signal decreases as the distance from the radioactive source increases. This error is minimized by maintaining the same distance between the window and each sample. For the best results, the window of the probe should be in direct contact with the sample, which means that the sample should be flat and smooth to provide a good contact surface.

4.5 Chemical matrix effects result from differences in the concentrations of interfering elements. These effects occur as either spectral interferences (peak overlaps) or as x-ray absorption and enhancement phenomena. Both effects are common in soils contaminated with heavy metals. As examples of absorption and enhancement effects; iron (Fe) tends to absorb copper (Cu) x-rays, reducing the intensity of the Cu measured by the detector, while chromium (Cr) will be enhanced at the expense of Fe because the absorption edge of Cr is slightly lower in energy than the fluorescent peak of iron. The effects can be corrected mathematically through the use of fundamental parameter (FP) coefficients. The effects also can be compensated for using SSCS, which contain all the elements present on site that can interfere with one another.

4.6 When present in a sample, certain x-ray lines from different elements can be very close in energy and, therefore, can cause interference by producing a severely overlapped spectrum. The degree to which a detector can resolve the two different peaks depends on the energy resolution of the detector. If the energy difference between the two peaks in electron volts is less than the resolution of the detector in electron volts, then the detector will not be able to fully resolve the peaks.

The most common spectrum overlaps involve the K_{β} line of element Z-1 with the K_{α} line of element Z. This is called the K_{α}/K_{β} interference. Because the $K_{\alpha}:K_{\beta}$ intensity ratio for a given element usually is about 7:1, the interfering element, Z-1, must be present at large concentrations to cause a problem. Two examples of this type of spectral interference involve the presence of large concentrations of vanadium (V) when attempting to measure Cr or the presence of large concentrations of Fe when attempting to measure cobalt (Co). The V K_{α} and K_{β} energies are 4.95

and 5.43 keV, respectively, and the Cr K_{α} energy is 5.41 keV. The Fe K_{α} and K_{β} energies are 6.40 and 7.06 keV, respectively, and the Co K_{α} energy is 6.92 keV. The difference between the V K_{β} and Cr K_{α} energies is 20 eV, and the difference between the Fe K_{β} and the Co K_{α} energies is 140 eV. The resolution of the highest-resolution detectors in FPXRF instruments is 170 eV. Therefore, large amounts of V and Fe will interfere with quantitation of Cr or Co, respectively. The presence of Fe is a frequent problem because it is often found in soils at tens of thousands of parts per million (ppm).

4.7 Other interferences can arise from K/L, K/M, and L/M line overlaps, although these overlaps are less common. Examples of such overlap involve arsenic (As) K_{α} /lead (Pb) L_{α} and sulfur (S) K_{α} /Pb M_{α} . In the As/Pb case, Pb can be measured from the Pb L_{β} line, and As can be measured from either the As K_{α} or the As K_{β} line; in this way the interference can be corrected. If the As K_{β} line is used, sensitivity will be decreased by a factor of two to five times because it is a less intense line than the As K_{α} line. If the As K_{α} line is used in the presence of Pb, mathematical corrections within the instrument software can be used to subtract out the Pb interference. However, because of the limits of mathematical corrections, As concentrations cannot be efficiently calculated for samples with Pb:As ratios of 10:1 or more. This high ratio of Pb to As may result in no As being reported regardless of the actual concentration present.

No instrument can fully compensate for this interference. It is important for an operator to understand this limitation of FPXRF instruments and consult with the manufacturer of the FPXRF instrument to evaluate options to minimize this limitation. The operator's decision will be based on action levels for metals in soil established for the site, matrix effects, capabilities of the instrument, data quality objectives, and the ratio of lead to arsenic known to be present at the site. If a site is encountered that contains lead at concentrations greater than ten times the concentration of arsenic it is advisable that all critical soil samples be sent off site for confirmatory analysis by an EPA-approved method.

4.8 If SSCS are used to calibrate an FPXRF instrument, the samples collected must be representative of the site under investigation. Representative soil sampling ensures that a sample or group of samples accurately reflects the concentrations of the contaminants of concern at a given time and location. Analytical results for representative samples reflect variations in the presence and concentration ranges of contaminants throughout a site. Variables affecting sample representativeness include differences in soil type, contaminant concentration variability, sample collection and preparation variability, and analytical variability, all of which should be minimized as much as possible.

4.9 Soil physical and chemical effects may be corrected using SSCS that have been analyzed by inductively coupled plasma (ICP) or atomic absorption (AA) methods. However, a major source of error can be introduced if these samples are not representative of the site or if the analytical error is large. Another concern is the type of digestion procedure used to prepare the soil samples for the reference analysis. Analytical results for the confirmatory method will vary depending on whether a partial digestion procedure, such as SW-846 Method 3050, or a total digestion procedure, such as Method 3052 is used. It is known that depending on the nature of the soil or sediment, Method 3050 will achieve differing extraction efficiencies for different analytes of interest. The confirmatory method should meet the project data quality objectives.

XRF measures the total concentration of an element; therefore, to achieve the greatest comparability of this method with the reference method (reduced bias), a total digestion procedure should be used for sample preparation. However, in the study used to generate the performance data for this method, the confirmatory method used was Method 3050, and the FPXRF data

compared very well with regression correlation coefficients (r^2 often exceeding 0.95, except for barium and chromium. See Table 9 in Section 17.0). The critical factor is that the digestion procedure and analytical reference method used should meet the data quality objectives (DQOs) of the project and match the method used for confirmation analysis.

4.10 Ambient temperature changes can affect the gain of the amplifiers producing instrument drift. Gain or drift is primarily a function of the electronics (amplifier or preamplifier) and not the detector as most instrument detectors are cooled to a constant temperature. Most FPXRF instruments have a built-in automatic gain control. If the automatic gain control is allowed to make periodic adjustments, the instrument will compensate for the influence of temperature changes on its energy scale. If the FPXRF instrument has an automatic gain control function, the operator will not have to adjust the instrument's gain unless an error message appears. If an error message appears, the operator should follow the manufacturer's procedures for troubleshooting the problem. Often, this involves performing a new energy calibration. The performance of an energy calibration check to assess drift is a quality control measure discussed in Section 9.2.

If the operator is instructed by the manufacturer to manually conduct a gain check because of increasing or decreasing ambient temperature, it is standard to perform a gain check after every 10 to 20 sample measurements or once an hour whichever is more frequent. It is also suggested that a gain check be performed if the temperature fluctuates more than 10 to 20°F. The operator should follow the manufacturer's recommendations for gain check frequency.

5.0 SAFETY

5.1 Proper training for the safe operation of the instrument and radiation training should be completed by the analyst prior to analysis. Radiation safety for each specific instrument can be found in the operators manual. Protective shielding should never be removed by the analyst or any personnel other than the manufacturer. The analyst should be aware of the local state and national regulations that pertain to the use of radiation-producing equipment and radioactive materials with which compliance is required. Licenses for radioactive materials are of two types; (1) general license which is usually provided by the manufacturer for receiving, acquiring, owning, possessing, using, and transferring radioactive material incorporated in a device or equipment, and (2) specific license which is issued to named persons for the operation of radioactive instruments as required by local state agencies. There should be a person appointed within the organization that is solely responsible for properly instructing all personnel, maintaining inspection records, and monitoring x-ray equipment at regular intervals. A copy of the radioactive material licenses and leak tests should be present with the instrument at all times and available to local and national authorities upon request. X-ray tubes do not require radioactive material licenses or leak tests, but do require approvals and licenses which vary from state to state. In addition, fail-safe x-ray warning lights should be illuminated whenever an x-ray tube is energized. Provisions listed above concerning radiation safety regulations, shielding, training, and responsible personnel apply to x-ray tubes just as to radioactive sources. In addition, a log of the times and operating conditions should be kept whenever an x-ray tube is energized. Finally, an additional hazard present with x-ray tubes is the danger of electric shock from the high voltage supply. The danger of electric shock is as substantial as the danger from radiation but is often overlooked because of its familiarity.

5.2 Radiation monitoring equipment should be used with the handling of the instrument. The operator and the surrounding environment should be monitored continually for analyst exposure to radiation. Thermal luminescent detectors (TLD) in the form of badges and rings are used to monitor operator radiation exposure. The TLDs should be worn in the area of most frequent exposure. The maximum permissible whole-body dose from occupational exposure is 5

Roentgen Equivalent Man (REM) per year. Possible exposure pathways for radiation to enter the body are ingestion, inhaling, and absorption. The best precaution to prevent radiation exposure is distance and shielding.

5.3 Refer to Chapter Three for guidance on some proper safety protocols.

6.0 EQUIPMENT AND SUPPLIES

6.1 FPXRF Spectrometer: An FPXRF spectrometer consists of four major components: (1) a source that provides x-rays; (2) a sample presentation device; (3) a detector that converts x-ray-generated photons emitted from the sample into measurable electronic signals; and (4) a data processing unit that contains an emission or fluorescence energy analyzer, such as an MCA, that processes the signals into an x-ray energy spectrum from which elemental concentrations in the sample may be calculated, and a data display and storage system. These components and additional, optional items, are discussed below.

6.1.1 Excitation Sources: Most FPXRF instruments use sealed radioisotope sources to produce x-rays in order to irradiate samples. The FPXRF instrument may contain between one and three radioisotope sources. Common radioisotope sources used for analysis for metals in soils are iron (Fe)-55, cadmium (Cd)-109, americium (Am)-241, and curium (Cm)-244. These sources may be contained in a probe along with a window and the detector; the probe is connected to a data reduction and handling system by means of a flexible cable. Alternatively, the sources, window, and detector may be included in the same unit as the data reduction and handling system.

The relative strength of the radioisotope sources is measured in units of millicuries (mCi). All other components of the FPXRF system being equal, the stronger the source, the greater the sensitivity and precision of a given instrument. Radioisotope sources undergo constant decay. In fact, it is this decay process that emits the primary x-rays used to excite samples for FPXRF analysis. The decay of radioisotopes is measured in "half-lives." The half-life of a radioisotope is defined as the length of time required to reduce the radioisotopes strength or activity by half. Developers of FPXRF technologies recommend source replacement at regular intervals based on the source's half-life. The characteristic x-rays emitted from each of the different sources have energies capable of exciting a certain range of analytes in a sample. Table 2 summarizes the characteristics of four common radioisotope sources.

X-ray tubes have higher radiation output, no intrinsic lifetime limit, produce constant output over their lifetime, and do not have the disposal problems of radioactive sources but are just now appearing in FPXRF instruments. An electrically-excited x-ray tube operates by bombarding an anode with electrons accelerated by a high voltage. The electrons gain an energy in electron volts equal to the accelerating voltage and can excite atomic transitions in the anode, which then produces characteristic x-rays. These characteristic x-rays are emitted through a window which contains the vacuum required for the electron acceleration. An important difference between x-ray tubes and radioactive sources is that the electrons which bombard the anode also produce a continuum of x-rays across a broad range of energies in addition to the characteristic x-rays. This continuum is weak compared to the characteristic x-rays but can provide substantial excitation since it covers a broad energy range. It has the undesired property of producing background in the spectrum near the analyte x-ray lines when it is scattered by the sample. For this reason a filter is often used between the x-ray tube and the sample to suppress the continuum radiation while passing the characteristic

x-rays from the anode. This filter is sometimes incorporated into the window of the x-ray tube. The choice of accelerating voltage is governed by the anode material, since the electrons must have sufficient energy to excite the anode, which requires a voltage greater than the absorption edge of the anode material. The anode is most efficiently excited by voltages 2 to 2.5 times the edge energy (most x-rays per unit power to the tube), although voltages as low as 1.5 times the absorption edge energy will work. The characteristic x-rays emitted by the anode are capable of exciting a range of elements in the sample just as with a radioactive source. Table 3 gives the recommended operating voltages and the sample elements excited for some common anodes.

6.1.2 Sample Presentation Device: FPXRF instruments can be operated in two modes: in situ and intrusive. If operated in the in situ mode, the probe window is placed in direct contact with the soil surface to be analyzed. When an FPXRF instrument is operated in the intrusive mode, a soil or sediment sample must be collected, prepared, and placed in a sample cup. For most FPXRF instruments operated in the intrusive mode, the probe is rotated so that the window faces upward. A protective sample cover is placed over the window, and the sample cup is placed on top of the window inside the protective sample cover for analysis.

6.1.3 Detectors: The detectors in the FPXRF instruments can be either solid-state detectors or gas-filled, proportional counter detectors. Common solid-state detectors include mercuric iodide (HgI_2), silicon pin diode and lithium-drifted silicon $\text{Si}(\text{Li})$. The HgI_2 detector is operated at a moderately subambient temperature controlled by a low power thermoelectric cooler. The silicon pin diode detector also is cooled via the thermoelectric Peltier effect. The $\text{Si}(\text{Li})$ detector must be cooled to at least -90°C either with liquid nitrogen or by thermoelectric cooling via the Peltier effect. Instruments with a $\text{Si}(\text{Li})$ detector have an internal liquid nitrogen dewar with a capacity of 0.5 to 1.0 liter. Proportional counter detectors are rugged and lightweight, which are important features of a field portable detector. However, the resolution of a proportional counter detector is not as good as that of a solid-state detector. The energy resolution of a detector for characteristic x-rays is usually expressed in terms of full width at half-maximum (FWHM) height of the manganese K_α peak at 5.89 keV. The typical resolutions of the above mentioned detectors are as follows: HgI_2 -270 eV; silicon pin diode-250 eV; $\text{Si}(\text{Li})$ -170 eV; and gas-filled, proportional counter-750 eV.

During operation of a solid-state detector, an x-ray photon strikes a biased, solid-state crystal and loses energy in the crystal by producing electron-hole pairs. The electric charge produced is collected and provides a current pulse that is directly proportional to the energy of the x-ray photon absorbed by the crystal of the detector. A gas-filled, proportional counter detector is an ionization chamber filled with a mixture of noble and other gases. An x-ray photon entering the chamber ionizes the gas atoms. The electric charge produced is collected and provides an electric signal that is directly proportional to the energy of the x-ray photon absorbed by the gas in the detector.

6.1.4 Data Processing Units: The key component in the data processing unit of an FPXRF instrument is the MCA. The MCA receives pulses from the detector and sorts them by their amplitudes (energy level). The MCA counts pulses per second to determine the height of the peak in a spectrum, which is indicative of the target analyte's concentration. The spectrum of element peaks are built on the MCA. The MCAs in FPXRF instruments have from 256 to 2,048 channels. The concentrations of target analytes are usually shown in parts per million on a liquid crystal display (LCD) in the instrument. FPXRF instruments can store both spectra and from 100 to 500 sets of numerical analytical results. Most FPXRF

instruments are menu-driven from software built into the units or from PCs. Once the data-storage memory of an FPXRF unit is full, data can be downloaded by means of an RS-232 port and cable to a PC.

6.2 Spare battery chargers.

6.3 Polyethylene sample cups: 31 millimeters (mm) to 40 mm in diameter with collar, or equivalent (appropriate for FPXRF instrument).

6.4 X-ray window film: Mylar™, Kapton™, Spectrolene™, polypropylene, or equivalent; 2.5 to 6.0 micrometers (μm) thick.

6.5 Mortar and pestle: glass, agate, or aluminum oxide; for grinding soil and sediment samples.

6.6 Containers: glass or plastic to store samples.

6.7 Sieves: 60-mesh (0.25 mm), stainless-steel, Nylon, or equivalent for preparing soil and sediment samples.

6.8 Trowels: for smoothing soil surfaces and collecting soil samples.

6.9 Plastic bags: used for collection and homogenization of soil samples.

6.10 Drying oven: standard convection or toaster oven, for soil and sediment samples that require drying.

7.0 REAGENTS AND STANDARDS

7.1 Pure Element Standards: Each pure, single-element standard is intended to produce strong characteristic x-ray peaks of the element of interest only. Other elements present must not contribute to the fluorescence spectrum. A set of pure element standards for commonly sought analytes is supplied by the instrument manufacturer, if required for the instrument; not all instruments require the pure element standards. The standards are used to set the region of interest (ROI) for each element. They also can be used as energy calibration and resolution check samples.

7.2 Site-specific Calibration Standards: Instruments that employ fundamental parameters (FP) or similar mathematical models in minimizing matrix effects may not require SSCS. If the FP calibration model is to be optimized or if empirical calibration is necessary, then SSCSs must be collected, prepared, and analyzed.

7.2.1 The SSCS must be representative of the matrix to be analyzed by FPXRF. These samples must be well homogenized. A minimum of ten samples spanning the concentration ranges of the analytes of interest and of the interfering elements must be obtained from the site. A sample size of 4 to 8 ounces is recommended, and standard glass sampling jars should be used.

7.2.2 Each sample should be oven-dried for 2 to 4 hours at a temperature of less than 150°C. If mercury is to be analyzed, a separate sample portion must remain undried, as heating may volatilize the mercury. When the sample is dry, all large, organic debris and

nonrepresentative material, such as twigs, leaves, roots, insects, asphalt, and rock should be removed. The sample should be ground with a mortar and pestle and passed through a 60-mesh sieve. Only the coarse rock fraction should remain on the screen.

7.2.3 The sample should be homogenized by using a riffle splitter or by placing 150 to 200 grams of the dried, sieved sample on a piece of kraft or butcher paper about 1.5 by 1.5 feet in size. Each corner of the paper should be lifted alternately, rolling the soil over on itself and toward the opposite corner. The soil should be rolled on itself 20 times. Approximately 5 grams of the sample should then be removed and placed in a sample cup for FPXRF analysis. The rest of the prepared sample should be sent off site for ICP or AA analysis. The method use for confirmatory analysis should meet the data quality objectives of the project.

7.3 Blank Samples: The blank samples should be from a "clean" quartz or silicon dioxide matrix that is free of any analytes at concentrations above the method detection limits. These samples are used to monitor for cross-contamination and laboratory-induced contaminants or interferences.

7.4 Standard Reference Materials: Standard reference materials (SRM) are standards containing certified amounts of metals in soil or sediment. These standards are used for accuracy and performance checks of FPXRF analyses. SRMs can be obtained from the National Institute of Standards and Technology (NIST), the U.S. Geological Survey (USGS), the Canadian National Research Council, and the national bureau of standards in foreign nations. Pertinent NIST SRMs for FPXRF analysis include 2704, Buffalo River Sediment; 2709, San Joaquin Soil; and 2710 and 2711, Montana Soil. These SRMs contain soil or sediment from actual sites that has been analyzed using independent inorganic analytical methods by many different laboratories.

8.0 SAMPLE COLLECTION, PRESERVATION, AND STORAGE

Sample handling and preservation procedures used in FPXRF analyses should follow the guidelines in Chapter Three, Inorganic Analytes.

9.0 QUALITY CONTROL

9.1 Refer to Chapter One for additional guidance on quality assurance protocols. All field data sheets and quality control data should be maintained for reference or inspection.

9.2 Energy Calibration Check: To determine whether an FPXRF instrument is operating within resolution and stability tolerances, an energy calibration check should be run. The energy calibration check determines whether the characteristic x-ray lines are shifting, which would indicate drift within the instrument. As discussed in Section 4.10, this check also serves as a gain check in the event that ambient temperatures are fluctuating greatly (> 10 to 20°F).

The energy calibration check should be run at a frequency consistent with manufacturers recommendations. Generally, this would be at the beginning of each working day, after the batteries are changed or the instrument is shut off, at the end of each working day, and at any other time when the instrument operator believes that drift is occurring during analysis. A pure element such as iron, manganese, copper, or lead is often used for the energy calibration check. A manufacturer-recommended count time per source should be used for the check.

9.2.1 The instrument manufacturer's manual specifies the channel or kiloelectron volt level at which a pure element peak should appear and the expected intensity of the peak.

The intensity and channel number of the pure element as measured using the radioactive source should be checked and compared to the manufacturer's recommendation. If the energy calibration check does not meet the manufacturer's criteria, then the pure element sample should be repositioned and reanalyzed. If the criteria are still not met, then an energy calibration should be performed as described in the manufacturer's manual. With some FPXRF instruments, once a spectrum is acquired from the energy calibration check, the peak can be optimized and realigned to the manufacturer's specifications using their software.

9.3 Blank Samples: Two types of blank samples should be analyzed for FPXRF analysis: instrument blanks and method blanks. An instrument blank is used to verify that no contamination exists in the spectrometer or on the probe window.

9.3.1 The instrument blank can be silicon dioxide, a Teflon block, a quartz block, "clean" sand, or lithium carbonate. This instrument blank should be analyzed on each working day before and after analyses are conducted and once per every twenty samples. An instrument blank should also be analyzed whenever contamination is suspected by the analyst. The frequency of analysis will vary with the data quality objectives of the project. A manufacturer-recommended count time per source should be used for the blank analysis. No element concentrations above the method detection limits should be found in the instrument blank. If concentrations exceed these limits, then the probe window and the check sample should be checked for contamination. If contamination is not a problem, then the instrument must be "zeroed" by following the manufacturer's instructions.

9.3.2 A method blank is used to monitor for laboratory-induced contaminants or interferences. The method blank can be "clean" silica sand or lithium carbonate that undergoes the same preparation procedure as the samples. A method blank must be analyzed at least daily. The frequency of analysis will depend on the data quality objectives of the project. To be acceptable, a method blank must not contain any analyte at a concentration above its method detection limit. If an analyte's concentration exceeds its method detection limit, the cause of the problem must be identified, and all samples analyzed with the method blank must be reanalyzed.

9.4 Calibration Verification Checks: A calibration verification check sample is used to check the accuracy of the instrument and to assess the stability and consistency of the analysis for the analytes of interest. A check sample should be analyzed at the beginning of each working day, during active sample analyses, and at the end of each working day. The frequency of calibration checks during active analysis will depend on the data quality objectives of the project. The check sample should be a well characterized soil sample from the site that is representative of site samples in terms of particle size and degree of homogeneity and that contains contaminants at concentrations near the action levels. If a site-specific sample is not available, then an NIST or other SRM that contains the analytes of interest can be used to verify the accuracy of the instrument. The measured value for each target analyte should be within ± 20 percent (%D) of the true value for the calibration verification check to be acceptable. If a measured value falls outside this range, then the check sample should be reanalyzed. If the value continues to fall outside the acceptance range, the instrument should be recalibrated, and the batch of samples analyzed before the unacceptable calibration verification check must be reanalyzed.

9.5 Precision Measurements: The precision of the method is monitored by analyzing a sample with low, moderate, or high concentrations of target analytes. The frequency of precision measurements will depend on the data quality objectives for the data. A minimum of one precision sample should be run per day. Each precision sample should be analyzed 7 times in replicate. It

is recommended that precision measurements be obtained for samples with varying concentration ranges to assess the effect of concentration on method precision. Determining method precision for analytes at concentrations near the site action levels can be extremely important if the FPXRF results are to be used in an enforcement action; therefore, selection of at least one sample with target analyte concentrations at or near the site action levels or levels of concern is recommended. A precision sample is analyzed by the instrument for the same field analysis time as used for other project samples. The relative standard deviation (RSD) of the sample mean is used to assess method precision. For FPXRF data to be considered adequately precise, the RSD should not be greater than 20 percent with the exception of chromium. RSD values for chromium should not be greater than 30 percent.

The equation for calculating RSD is as follows:

$$\text{RSD} = (\text{SD}/\text{Mean Concentration}) \times 100$$

where:

RSD	=	Relative standard deviation for the precision measurement for the analyte
SD	=	Standard deviation of the concentration for the analyte
Mean Concentration	=	Mean concentration for the analyte

The precision or reproducibility of a measurement will improve with increasing count time, however, increasing the count time by a factor of 4 will provide only 2 times better precision, so there is a point of diminishing return. Increasing the count time also improves the detection limit, but decreases sample throughput.

9.6 Detection Limits: Results for replicate analyses of a low-concentration sample, SSCS, or SRM can be used to generate an average site-specific method detection and quantitation limits. In this case, the method detection limit is defined as 3 times the standard deviation of the results for the low-concentration samples and the method quantitation limit is defined as 10 times the standard deviation of the same results. Another means of determining method detection and quantitation limits involves use of counting statistics. In FPXRF analysis, the standard deviation from counting statistics is defined as $\text{SD} = (N)^{1/2}$, where SD is the standard deviation for a target analyte peak and N is the net counts for the peak of the analyte of interest (i.e., gross counts minus background under the peak). Three times this standard deviation would be the method detection limit and 10 times this standard deviation would be the method quantitation limit. If both of the above mentioned approaches are used to calculate method detection limits, the larger of the standard deviations should be used to provide the more conservative detection limits.

This SD based detection limit criteria must be used by the operator to evaluate each measurement for its useability. A measurement above the average calculated or manufacturer's detection limit, but smaller than three times its associated SD, should not be used as a quantitative measurement. Conversely, if the measurement is below the average calculated or manufacturer's detection limit, but greater than three times its associated SD. It should be coded as an estimated value.

9.7 Confirmatory Samples: The comparability of the FPXRF analysis is determined by submitting FPXRF-analyzed samples for analysis at a laboratory. The method of confirmatory analysis must meet the project and XRF measurement data quality objectives. The confirmatory samples must be splits of the well homogenized sample material. In some cases the prepared

sample cups can be submitted. A minimum of 1 sample for each 20 FPXRF-analyzed samples should be submitted for confirmatory analysis. This frequency will depend on data quality objectives. The confirmatory analyses can also be used to verify the quality of the FPXRF data. The confirmatory samples should be selected from the lower, middle, and upper range of concentrations measured by the FPXRF. They should also include samples with analyte concentrations at or near the site action levels. The results of the confirmatory analysis and FPXRF analyses should be evaluated with a least squares linear regression analysis. If the measured concentrations span more than one order of magnitude, the data should be log-transformed to standardize variance which is proportional to the magnitude of measurement. The correlation coefficient (r^2) for the results should be 0.7 or greater for the FPXRF data to be considered screening level data. If the r^2 is 0.9 or greater and inferential statistics indicate the FPXRF data and the confirmatory data are statistically equivalent at a 99 percent confidence level, the data could potentially meet definitive level data criteria.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Instrument Calibration: Instrument calibration procedures vary among FPXRF instruments. Users of this method should follow the calibration procedures outlined in the operator's manual for each specific FPXRF instrument. Generally, however, three types of calibration procedures exist for FPXRF instruments: FP calibration, empirical calibration, and the Compton peak ratio or normalization method. These three types of calibration are discussed below.

10.2 Fundamental Parameters Calibration: FP calibration procedures are extremely variable. An FP calibration provides the analyst with a "standardless" calibration. The advantages of FP calibrations over empirical calibrations include the following:

- No previously collected site-specific samples are required, although site-specific samples with confirmed and validated analytical results for all elements present could be used.
- Cost is reduced because fewer confirmatory laboratory results or calibration standards are required.

However, the analyst should be aware of the limitations imposed on FP calibration by particle size and matrix effects. These limitations can be minimized by adhering to the preparation procedure described in Section 7.2. The two FP calibration processes discussed below are based on an effective energy FP routine and a back scatter with FP (BFP) routine. Each FPXRF FP calibration process is based on a different iterative algorithmic method. The calibration procedure for each routine is explained in detail in the manufacturer's user manual for each FPXRF instrument; in addition, training courses are offered for each instrument.

10.2.1 Effective Energy FP Calibration: The effective energy FP calibration is performed by the manufacturer before an instrument is sent to the analyst. Although SSCS can be used, the calibration relies on pure element standards or SRMs such as those obtained from NIST for the FP calibration. The effective energy routine relies on the spectrometer response to pure elements and FP iterative algorithms to compensate for various matrix effects.

Alpha coefficients are calculated using a variation of the Sherman equation, which calculates theoretical intensities from the measurement of pure element samples. These coefficients indicate the quantitative effect of each matrix element on an analyte's measured

x-ray intensity. Next, the Lachance Traill algorithm is solved as a set of simultaneous equations based on the theoretical intensities. The alpha coefficients are then downloaded into the specific instrument.

The working effective energy FP calibration curve must be verified before sample analysis begins on each working day, after every 20 samples are analyzed, and at the end of sampling. This verification is performed by analyzing either an NIST SRM or an SSCS that is representative of the site-specific samples. This SRM or SSCS serves as a calibration check. A manufacturer-recommended count time per source should be used for the calibration check. The analyst must then adjust the y-intercept and slope of the calibration curve to best fit the known concentrations of target analytes in the SRM or SSCS.

A percent difference (%D) is then calculated for each target analyte. The %D should be within ± 20 percent of the certified value for each analyte. If the %D falls outside this acceptance range, then the calibration curve should be adjusted by varying the slope of the line or the y-intercept value for the analyte. The SRM or SSCS is reanalyzed until the %D falls within ± 20 percent. The group of 20 samples analyzed before an out-of-control calibration check should be reanalyzed.

The equation to calibrate %D is as follows:

$$\%D = ((C_s - C_k) / C_k) \times 100$$

where:

%D = Percent difference

C_k = Certified concentration of standard sample

C_s = Measured concentration of standard sample

10.2.2 BFP Calibration: BFP calibration relies on the ability of the liquid nitrogen-cooled, Si(Li) solid-state detector to separate the coherent (Compton) and incoherent (Rayleigh) backscatter peaks of primary radiation. These peak intensities are known to be a function of sample composition; and the ratio of the Compton to Rayleigh peak is a function of the mass absorption of the sample. The calibration procedure is explained in detail in the instrument manufacturer's manual. Following is a general description of the BFP calibration procedure.

The concentrations of all detected and quantified elements are entered into the computer software system. Certified element results for an NIST SRM or confirmed and validated results for an SSCS can be used. In addition, the concentrations of oxygen and silicon must be entered; these two concentrations are not found in standard metals analyses. The manufacturer provides silicon and oxygen concentrations for typical soil types. Pure element standards are then analyzed using a manufacturer-recommended count time per source. The results are used to calculate correction factors in order to adjust for spectrum overlap of elements.

The working BFP calibration curve must be verified before sample analysis begins on each working day, after every 20 samples are analyzed, and at the end of the analysis. This verification is performed by analyzing either an NIST SRM or an SSCS that is representative of the site-specific samples. This SRM or SSCS serves as a calibration check. The standard sample is analyzed using a manufacturer-recommended count time per source to check the

calibration curve. The analyst must then adjust the y-intercept and slope of the calibration curve to best fit the known concentrations of target analytes in the SRM or SSCS.

A %D is then calculated for each target analyte. The %D should fall within ± 20 percent of the certified value for each analyte. If the %D falls outside this acceptance range, then the calibration curve should be adjusted by varying the slope of the line the y-intercept value for the analyte. The standard sample is reanalyzed until the %D falls within ± 20 percent. The group of 20 samples analyzed before an out-of-control calibration check should be reanalyzed.

10.3 Empirical Calibration: An empirical calibration can be performed with SSCS, site-typical standards, or standards prepared from metal oxides. A discussion of SSCS is included in Section 7.2; if no previously characterized samples exist for a specific site, site-typical standards can be used. Site-typical standards may be selected from commercially available characterized soils or from SSCS prepared for another site. The site-typical standards should closely approximate the site's soil matrix with respect to particle size distribution, mineralogy, and contaminant analytes. If neither SSCS nor site-typical standards are available, it is possible to make gravimetric standards by adding metal oxides to a "clean" sand or silicon dioxide matrix that simulates soil. Metal oxides can be purchased from various chemical vendors. If standards are made on site, a balance capable of weighing items to at least two decimal places is required. Concentrated ICP or AA standard solutions can also be used to make standards. These solutions are available in concentrations of 10,000 parts per million, thus only small volumes have to be added to the soil.

An empirical calibration using SSCS involves analysis of SSCS by the FPXRF instrument and by a conventional analytical method such as ICP or AA. A total acid digestion procedure should be used by the laboratory for sample preparation. Generally, a minimum of 10 and a maximum of 30 well characterized SSCS, site-typical standards, or prepared metal oxide standards are required to perform an adequate empirical calibration. The number of required standards depends on the number of analytes of interest and interfering elements. Theoretically, an empirical calibration with SSCS should provide the most accurate data for a site because the calibration compensates for site-specific matrix effects.

The first step in an empirical calibration is to analyze the pure element standards for the elements of interest. This enables the instrument to set channel limits for each element for spectral deconvolution. Next the SSCS, site-typical standards, or prepared metal oxide standards are analyzed using a count time of 200 seconds per source or a count time recommended by the manufacturer. This will produce a spectrum and net intensity of each analyte in each standard. The analyte concentrations for each standard are then entered into the instrument software; these concentrations are those obtained from the laboratory, the certified results, or the gravimetrically determined concentrations of the prepared standards. This gives the instrument analyte values to regress against corresponding intensities during the modeling stage. The regression equation correlates the concentrations of an analyte with its net intensity.

The calibration equation is developed using a least squares fit regression analysis. After the regression terms to be used in the equation are defined, a mathematical equation can be developed to calculate the analyte concentration in an unknown sample. In some FPXRF instruments, the software of the instrument calculates the regression equation. The software uses calculated intercept and slope values to form a multiterm equation. In conjunction with the software in the instrument, the operator can adjust the multiterm equation to minimize interelement interferences and optimize the intensity calibration curve.

It is possible to define up to six linear or nonlinear terms in the regression equation. Terms can be added and deleted to optimize the equation. The goal is to produce an equation with the smallest regression error and the highest correlation coefficient. These values are automatically computed by the software as the regression terms are added, deleted, or modified. It is also possible to delete data points from the regression line if these points are significant outliers or if they are heavily weighing the data. Once the regression equation has been selected for an analyte, the equation can be entered into the software for quantitation of analytes in subsequent samples. For an empirical calibration to be acceptable, the regression equation for a specific analyte should have a correlation coefficient of 0.98 or greater or meet the DQOs of the project.

In an empirical calibration, one must apply the DQOs of the project and ascertain critical or action levels for the analytes of interest. It is within these concentration ranges or around these action levels that the FPXRF instrument should be calibrated most accurately. It may not be possible to develop a good regression equation over several orders of analyte concentration.

10.4 Compton Normalization Method: The Compton normalization method is based on analysis of a single, certified standard and normalization for the Compton peak. The Compton peak is produced from incoherent backscattering of x-ray radiation from the excitation source and is present in the spectrum of every sample. The Compton peak intensity changes with differing matrices. Generally, matrices dominated by lighter elements produce a larger Compton peak, and those dominated by heavier elements produce a smaller Compton peak. Normalizing to the Compton peak can reduce problems with varying matrix effects among samples. Compton normalization is similar to the use of internal standards in organics analysis. The Compton normalization method may not be effective when analyte concentrations exceed a few percent.

The certified standard used for this type of calibration could be an NIST SRM such as 2710 or 2711. The SRM must be a matrix similar to the samples and must contain the analytes of interests at concentrations near those expected in the samples. First, a response factor has to be determined for each analyte. This factor is calculated by dividing the net peak intensity by the analyte concentration. The net peak intensity is gross intensity corrected for baseline interference. Concentrations of analytes in samples are then determined by multiplying the baseline corrected analyte signal intensity by the normalization factor and by the response factor. The normalization factor is the quotient of the baseline corrected Compton K_{α} peak intensity of the SRM divided by that of the samples. Depending on the FPXRF instrument used, these calculations may be done manually or by the instrument software.

11.0 PROCEDURE

11.1 Operation of the various FPXRF instruments will vary according to the manufacturers' protocols. Before operating any FPXRF instrument, one should consult the manufacturer's manual. Most manufacturers recommend that their instruments be allowed to warm up for 15 to 30 minutes before analysis of samples. This will help alleviate drift or energy calibration problems later on in analysis.

11.2 Each FPXRF instrument should be operated according to the manufacturer's recommendations. There are two modes in which FPXRF instruments can be operated: in situ and intrusive. The in situ mode involves analysis of an undisturbed soil sediment or sample. Intrusive analysis involves collection and preparation of a soil or sediment sample before analysis. Some FPXRF instruments can operate in both modes of analysis, while others are designed to operate in only one mode. The two modes of analysis are discussed below.

11.3 For in situ analysis, one requirement is that any large or nonrepresentative debris be removed from the soil surface before analysis. This debris includes rocks, pebbles, leaves, vegetation, roots, and concrete. Another requirement is that the soil surface be as smooth as possible so that the probe window will have good contact with the surface. This may require some leveling of the surface with a stainless-steel trowel. During the study conducted to provide data for this method, this modest amount of sample preparation was found to take less than 5 minutes per sample location. The last requirement is that the soil or sediment not be saturated with water. Manufacturers state that their FPXRF instruments will perform adequately for soils with moisture contents of 5 to 20 percent but will not perform well for saturated soils, especially if ponded water exists on the surface. Another recommended technique for *in situ* analysis is to tamp the soil to increase soil density and compactness for better repeatability and representativeness. This condition is especially important for heavy element analysis, such as barium. Source count times for in situ analysis usually range from 30 to 120 seconds, but source count times will vary among instruments and depending on required detection limits.

11.4 For intrusive analysis of surface or sediment, it is recommended that a sample be collected from a 4- by 4-inch square that is 1 inch deep. This will produce a soil sample of approximately 375 grams or 250 cm³, which is enough soil to fill an 8-ounce jar. The sample should be homogenized, dried, and ground before analysis. The sample can be homogenized before or after drying. The homogenization technique to be used after drying is discussed in Section 4.2. If the sample is homogenized before drying, it should be thoroughly mixed in a beaker or similar container, or if the sample is moist and has a high clay content, it can be kneaded in a plastic bag. One way to monitor homogenization when the sample is kneaded in a plastic bag is to add sodium fluorescein dye to the sample. After the moist sample has been homogenized, it is examined under an ultraviolet light to assess the distribution of sodium fluorescein throughout the sample. If the fluorescent dye is evenly distributed in the sample, homogenization is considered complete; if the dye is not evenly distributed, mixing should continue until the sample has been thoroughly homogenized. During the study conducted to provide data for this method, the homogenization procedure using the fluorescein dye required 3 to 5 minutes per sample. As demonstrated in Sections 13.5 and 13.7, homogenization has the greatest impact on the reduction of sampling variability. It produces little or no contamination. Often, it can be used without the more labor intensive steps of drying, grinding, and sieving given in Sections 11.5 and 11.6. Of course, to achieve the best data quality possible all four steps must be followed.

11.5 Once the soil or sediment sample has been homogenized, it should be dried. This can be accomplished with a toaster oven or convection oven. A small aliquot of the sample (20 to 50 grams) is placed in a suitable container for drying. The sample should be dried for 2 to 4 hours in the convection or toaster oven at a temperature not greater than 150°C. Microwave drying is not a recommended procedure. Field studies have shown that microwave drying can increase variability between the FPXRF data and confirmatory analysis. High levels of metals in a sample can cause arcing in the microwave oven, and sometimes slag forms in the sample. Microwave oven drying can also melt plastic containers used to hold the sample.

11.6 The homogenized dried sample material should be ground with a mortar and pestle and passed through a 60-mesh sieve to achieve a uniform particle size. Sample grinding should continue until at least 90 percent of the original sample passes through the sieve. The grinding step normally takes an average of 10 minutes per sample. An aliquot of the sieved sample should then be placed in a 31.0-mm polyethylene sample cup (or equivalent) for analysis. The sample cup should be one-half to three-quarters full at a minimum. The sample cup should be covered with a 2.5 µm Mylar (or equivalent) film for analysis. The rest of the soil sample should be placed in a jar, labeled, and archived for possible confirmation analysis. All equipment including the mortar, pestle,

and sieves must be thoroughly cleaned so that any cross-contamination is below the MDLs of the procedure or DQOs of the analysis.

12.0 DATA ANALYSIS AND CALCULATIONS

Most FPXRF instruments have software capable of storing all analytical results and spectra. The results are displayed in parts per million and can be downloaded to a PC, which can provide a hard copy printout. Individual measurements that are smaller than three times their associated SD should not be used for quantitation.

13.0 METHOD PERFORMANCE

13.1 This section discusses four performance factors, field-based method detection limits, precision, accuracy, and comparability to EPA-approved methods. The numbers presented in Tables 4 through 9 were generated from data obtained from six FPXRF instruments. The soil samples analyzed by the six FPXRF instruments were collected from two sites in the United States. The soil samples contained several of the target analytes at concentrations ranging from nondetect to tens of thousands of mg/kg.

13.2 The six FPXRF instruments included the TN 9000 and TN Lead Analyzer manufactured by TN Spectrace; the X-MET 920 with a SiLi detector and X-MET 920 with a gas-filled proportional detector manufactured by Metorex, Inc.; the XL Spectrum Analyzer manufactured by Niton; and the MAP Spectrum Analyzer manufactured by Scitec. The TN 9000 and TN Lead Analyzer both have a HgI₂ detector. The TN 9000 utilized an Fe-55, Cd-109, and Am-241 source. The TN Lead Analyzer had only a Cd-109 source. The X-Met 920 with the SiLi detector had a Cd-109 and Am-241 source. The X-MET 920 with the gas-filled proportional detector had only a Cd-109 source. The XL Spectrum Analyzer utilized a silicon pin-diode detector and a Cd-109 source. The MAP Spectrum Analyzer utilized a solid-state silicon detector and a Cd-109 source.

13.3 All data presented in Tables 4 through 9 were generated using the following calibrations and source count times. The TN 9000 and TN Lead Analyzer were calibrated using fundamental parameters using NIST SRM 2710 as a calibration check sample. The TN 9000 was operated using 100, 60, and 60 second count times for the Cd-109, Fe-55, and Am-241 sources, respectively. The TN Lead analyzer was operated using a 60 second count time for the Cd-109 source. The X-MET 920 with the Si(Li) detector was calibrated using fundamental parameters and one well characterized site-specific soil standard as a calibration check. It used 140 and 100 second count times for the Cd-109 and Am-241 sources, respectively. The X-MET 920 with the gas-filled proportional detector was calibrated empirically using between 10 and 20 well characterized site-specific soil standards. It used 120 second times for the Cd-109 source. The XL Spectrum Analyzer utilized NIST SRM 2710 for calibration and the Compton peak normalization procedure for quantitation based on 60 second count times for the Cd-109 source. The MAP Spectrum Analyzer was internally calibrated by the manufacturer. The calibration was checked using a well-characterized site-specific soil standard. It used 240 second times for the Cd-109 source.

13.4 Field-Based Method Detection Limits: The field-based method detection limits are presented in Table 4. The field-based method detection limits were determined by collecting ten replicate measurements on site-specific soil samples with metals concentrations 2 to 5 times the expected method detection limits. Based on these ten replicate measurements, a standard deviation on the replicate analysis was calculated. The method detection limits presented in Table 4 are defined as 3 times the standard deviation for each analyte.

The field-based method detection limits were generated by using the count times discussed earlier in this section. All the field-based method detection limits were calculated for soil samples that had been dried and ground and placed in a sample cup with the exception of the MAP Spectrum Analyzer. This instrument can only be operated in the in situ mode, meaning the samples were moist and not ground.

Some of the analytes such as cadmium, mercury, silver, selenium, and thorium were not detected or only detected at very low concentrations such that a field-based method detection limit could not be determined. These analytes are not presented in Table 4. Other analytes such as calcium, iron, potassium, and titanium were only found at high concentrations (thousands of mg/kg) so that reasonable method detection limits could not be calculated. These analytes also are not presented in Table 4.

13.5 Precision Measurements: The precision data is presented in Table 5. Each of the six FPXRF instruments performed 10 replicate measurements on 12 soil samples that had analyte concentrations ranging from nondetects to thousands of mg/kg. Each of the 12 soil samples underwent 4 different preparation techniques from in situ (no preparation) to dried and ground in a sample cup. Therefore, there were 48 precision data points for five of the instruments and 24 precision points for the MAP Spectrum Analyzer. The replicate measurements were taken using the source count times discussed at the beginning of this section.

For each detectable analyte in each precision sample a mean concentration, standard deviation, and RSD was calculated for each analyte. The data presented in Table 5 is an average RSD for the precision samples that had analyte concentrations at 5 to 10 times the MDL for that analyte for each instrument. Some analytes such as mercury, selenium, silver, and thorium were not detected in any of the precision samples so these analytes are not listed in Table 5. Some analytes such as cadmium, nickel, and tin were only detected at concentrations near the MDLs so that an RSD value calculated at 5 to 10 times the MDL was not possible.

One FPXRF instrument collected replicate measurements on an additional nine soil samples to provide a better assessment of the effect of sample preparation on precision. Table 6 shows these results. The additional nine soil samples were comprised of three from each texture and had analyte concentrations ranging from near the detection limit of the FPXRF analyzer to thousands of mg/kg. The FPXRF analyzer only collected replicate measurements from three of the preparation methods; no measurements were collected from the *in situ* homogenized samples. The FPXRF analyzer conducted five replicate measurements of the in situ field samples by taking measurements at five different points within the 4-inch by 4-inch sample square. Ten replicate measurements were collected for both the intrusive undried and unground and intrusive dried and ground samples contained in cups. The cups were shaken between each replicate measurement.

Table 6 shows that the precision dramatically improved from the in situ to the intrusive measurements. In general there was a slight improvement in precision when the sample was dried and ground. Two factors caused the precision for the in situ measurements to be poorer. The major factor is soil heterogeneity. By moving the probe within the 4-inch by 4-inch square, measurements of different soil samples were actually taking place within the square. Table 6 illustrates the dominant effect of soil heterogeneity. It overwhelmed instrument precision when the FPXRF analyzer was used in this mode. The second factor that caused the RSD values to be higher for the in situ measurements is the fact that only five versus ten replicates were taken. A lesser number of measurements caused the standard deviation to be larger which in turn elevated the RSD values.

13.6 Accuracy Measurements: Five of the FPXRF instruments (not including the MAP Spectrum Analyzer) analyzed 18 SRMs using the source count times and calibration methods given at the beginning of this section. The 18 SRMs included 9 soil SRMs, 4 stream or river sediment SRMs, 2 sludge SRMs, and 3 ash SRMs. Each of the SRMs contained known concentrations of certain target analytes. A percent recovery was calculated for each analyte in each SRM for each FPXRF instrument. Table 7 presents a summary of this data. With the exception of cadmium, chromium, and nickel, the values presented in Table 7 were generated from the 13 soil and sediment SRMs only. The 2 sludge and 3 ash SRMs were included for cadmium, chromium, and nickel because of the low or nondetectable concentrations of these three analytes in the soil and sediment SRMs.

Only 12 analytes are presented in Table 7. These are the analytes that are of environmental concern and provided a significant number of detections in the SRMs for an accuracy assessment. No data is presented for the X-MET 920 with the gas-filled proportional detector. This FPXRF instrument was calibrated empirically using site-specific soil samples. The percent recovery values from this instrument were very sporadic and the data did not lend itself to presentation in Table 7.

Table 8 provides a more detailed summary of accuracy data for one FPXRF instrument (TN 9000) for the 9 soil SRMs and 4 sediment SRMs. Table 8 shows the certified value, measured value, and percent recovery for five analytes. These analytes were chosen because they are of environmental concern and were most prevalently certified for in the SRM and detected by the FPXRF instrument. The first nine SRMs are soil and the last 4 SRMs are sediment. Percent recoveries for the four NIST SRMs were often between 90 and 110 percent for all analytes.

13.7 Comparability: Comparability refers to the confidence with which one data set can be compared to another. In this case, FPXRF data generated from a large study of six FPXRF instruments was compared to SW-846 Methods 3050 and 6010 which are the standard soil extraction for metals and analysis by inductively coupled plasma. An evaluation of comparability was conducted by using linear regression analysis. Three factors were determined using the linear regression. These factors were the y-intercept, the slope of the line, and the coefficient of determination (r^2).

As part of the comparability assessment, the effects of soil type and preparation methods were studied. Three soil types (textures) and four preparation methods were examined during the study. The preparation methods evaluated the cumulative effect of particle size, moisture, and homogenization on comparability. Due to the large volume of data produced during this study, linear regression data for six analytes from only one FPXRF instrument is presented in Table 9. Similar trends in the data were seen for all instruments.

Table 9 shows the regression parameters for the whole data set, broken out by soil type, and by preparation method. The soil types are as follows: soil 1--sand; soil 2--loam; and soil 3--silty clay. The preparation methods are as follows: preparation 1--in situ in the field; preparation 2--in situ, sample collected and homogenized; preparation 3--intrusive, with sample in a sample cup but sample still wet and not ground; and preparation 4--sample dried, ground, passed through a 40-mesh sieve, and placed in sample cup.

For arsenic, copper, lead, and zinc, the comparability to the confirmatory laboratory was excellent with r^2 values ranging from 0.80 to 0.99 for all six FPXRF instruments. The slopes of the regression lines for arsenic, copper, lead, and zinc, were generally between 0.90 and 1.00 indicating the data would need to be corrected very little or not at all to match the confirmatory laboratory data. The r^2 values and slopes of the regression lines for barium and chromium were

not as good as for the other for analytes, indicating the data would have to be corrected to match the confirmatory laboratory.

Table 9 demonstrates that there was little effect of soil type on the regression parameters for any of the six analytes. The only exceptions were for barium in soil 1 and copper in soil 3. In both of these cases, however, it is actually a concentration effect and not a soil effect causing the poorer comparability. All barium and copper concentrations in soil 1 and 3, respectively, were less than 350 mg/kg.

Table 9 shows there was a preparation effect on the regression parameters for all six analytes. With the exception of chromium, the regression parameters were primarily improved going from preparation 1 to preparation 2. In this step, the sample was removed from the soil surface, all large debris was removed, and the sample was thoroughly homogenized. The additional two preparation methods did little to improve the regression parameters. This data indicates that homogenization is the most critical factor when comparing the results. It is essential that the sample sent to the confirmatory laboratory match the FPXRF sample as closely as possible.

Section 11.0 of this method discusses the time necessary for each of the sample preparation techniques. Based on the data quality objectives for the project, an analyst must decide if it is worth the extra time required to dry and grind the sample for small improvements in comparability. Homogenization requires 3 to 5 minutes. Drying the sample requires one to two hours. Grinding and sieving requires another 10 to 15 minutes per sample. Lastly, when grinding and sieving is conducted, time must be allotted to decontaminate the mortars, pestles, and sieves. Drying and grinding the samples and decontamination procedures will often dictate that an extra person be on site so that the analyst can keep up with the sample collection crew. The cost of requiring an extra person on site to prepare samples must be balanced with the gain in data quality and sample throughput.

13.8 The following documents may provide additional guidance and insight on this method and technique:

13.8.1 Hewitt, A.D. 1994. "Screening for Metals by X-ray Fluorescence Spectrometry/Response Factor/Compton K_{α} Peak Normalization Analysis." *American Environmental Laboratory*. Pages 24-32.

13.8.2 Piorek, S., and J.R. Pasmore. 1993. "Standardless, In Situ Analysis of Metallic Contaminants in the Natural Environment With a PC-Based, High Resolution Portable X-Ray Analyzer." *Third International Symposium on Field Screening Methods for Hazardous Waste and Toxic Chemicals*. Las Vegas, Nevada. February 24-26, 1993. Volume 2, Pages 1135-1151.

14.0 POLLUTION PREVENTION

14.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity and/or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The EPA has established a preferred hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the Agency recommends recycling as the next best option.

14.2 For information about pollution prevention that may be applicable to laboratories and research institutions consult *Less is Better: Laboratory Chemical management for Waste Reduction* available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington D.C. 20036, (202) 872-4477.

15.0 WASTE MANAGEMENT

The Environmental Protection Agency requires that laboratory waste management practices be conducted consistent with all applicable rules and regulations. The Agency urges laboratories to protect the air, water, and land by minimizing and controlling all releases from hoods and bench operations, complying with the letter and spirit of any sewer discharge permits and regulations, and by complying with all solid and hazardous waste regulations, particularly the hazardous waste identification rules and land disposal restrictions. For further information on waste management, consult *The Waste Management Manual for Laboratory Personnel* available from the American Chemical Society at the address listed in Sec. 14.2.

16.0 REFERENCES

1. Metorex. X-MET 920 User's Manual.
2. Spectrace Instruments. 1994. Energy Dispersive X-ray Fluorescence Spectrometry: An Introduction.
3. TN Spectrace. Spectrace 9000 Field Portable/Benchtop XRF Training and Applications Manual.
4. Unpublished SITE data, recieved from PRC Environment Management, Inc.

17.0 TABLES, DIAGRAMS, FLOWCHARTS, AND VALIDATION DATA

The pages to follow contain Tables 1 through 9 and a method procedure flow diagram.

TABLE 1
INTERFERENCE FREE DETECTION LIMITS

Analyte	Chemical Abstract Series Number	Detection Limit in Quartz Sand (milligrams per kilogram)
Antimony (Sb)	7440-36-0	40
Arsenic (As)	7440-38-0	40
Barium (Ba)	7440-39-3	20
Cadmium (Cd)	7440-43-9	100
Calcium (Ca)	7440-70-2	70
Chromium (Cr)	7440-47-3	150
Cobalt (Co)	7440-48-4	60
Copper (Cu)	7440-50-8	50
Iron (Fe)	7439-89-6	60
Lead (Pb)	7439-92-1	20
Manganese (Mn)	7439-96-5	70
Mercury (Hg)	7439-97-6	30
Molybdenum (Mo)	7439-93-7	10
Nickel (Ni)	7440-02-0	50
Potassium (K)	7440-09-7	200
Rubidium (Rb)	7440-17-7	10
Selenium (Se)	7782-49-2	40
Silver (Ag)	7440-22-4	70
Strontium (Sr)	7440-24-6	10
Thallium (Tl)	7440-28-0	20
Thorium (Th)	7440-29-1	10
Tin (Sn)	7440-31-5	60
Titanium (Ti)	7440-32-6	50
Vanadium (V)	7440-62-2	50
Zinc (Zn)	7440-66-6	50
Zirconium (Zr)	7440-67-7	10

Source: References 1, 2, and 3

TABLE 2
SUMMARY OF RADIOISOTOPE SOURCE CHARACTERISTICS

Source	Activity (mCi)	Half-Life (Years)	Excitation Energy (keV)	Elemental Analysis Range	
Fe-55	20-50	2.7	5.9	Sulfur to Chromium Molybdenum to Barium	K Lines L Lines
Cd-109	5-30	1.3	22.1 and 87.9	Calcium to Rhodium Tantalum to Lead Barium to Uranium	K Lines K Lines L Lines
Am-241	5-30	458	26.4 and 59.6	Copper to Thulium Tungsten to Uranium	K Lines L Lines
Cm-244	60-100	17.8	14.2	Titanium to Selenium Lanthanum to Lead	K Lines L Lines

Source: Reference 1, 2, and 3

TABLE 3
SUMMARY OF X-RAY TUBE SOURCE CHARACTERISTICS

Anode Material	Recommended Voltage Range (kV)	K-alpha Emission (keV)	Elemental Analysis Range	
Cu	18-22	8.04	Potassium to Cobalt Silver to Gadolinium	K Lines L Lines
Mo	40-50	17.4	Cobalt to Yttrium Europium to Radon	K Lines L Lines
Ag	50-65	22.1	Zinc to Technetium Ytterbium to Neptunium	K Lines L Lines

Source: Reference 4

Notes: The sample elements excited are chosen by taking as the lower limit the same ratio of excitation line energy to element absorption edge as in Table 2 (approximately 0.45) and the requirement that the excitation line energy be above the element absorption edge as the upper limit (L2 edges used for L lines). K-beta excitation lines were ignored.

TABLE 4
FIELD-BASED METHOD DETECTION LIMITS (mg/kg)^a

Analyte	Instrument					
	TN 9000	TN Lead Analyzer	X-MET 920 (SiLi Detector)	X-MET 920 (Gas-Filled Detector)	XL Spectrum Analyzer	MAP Spectrum Analyzer
Antimony	55	NR	NR	NR	NR	NR
Arsenic	60	50	55	50	110	225
Barium	60	NR	30	400	NR	NR
Chromium	200	460	210	110	900	NR
Cobalt	330	NR	NR	NR	NR	NR
Copper	85	115	75	100	125	525
Lead	45	40	45	100	75	165
Manganese	240	340	NR	NR	NR	NR
Molybdenum	25	NR	NR	NR	30	NR
Nickel	100	NR	NA	NA	NA	NR
Rubidium	30	NR	NR	NR	45	NR
Strontium	35	NR	NR	NR	40	NR
Tin	85	NR	NR	NR	NR	NR
Zinc	80	95	70	NA	110	NA
Zirconium	40	NR	NR	NR	25	NR

Source: Reference 4

^a MDLs are related to the total number of counts taken. See Section 13.3 for count times used to generate this table.

NR Not reported.

NA Not applicable; analyte was reported but was not at high enough concentrations for method detection limit to be determined.

TABLE 5
PRECISION

Analyte	Average Relative Standard Deviation for Each Instrument at 5 to 10 Times the MDL					
	TN 9000	TN Lead Analyzer	X-MET 920 (SiLi Detector)	X-MET 920 (Gas-Filled Detector)	XL Spectrum Analyzer	MAP Spectrum Analyzer
Antimony	6.54	NR	NR	NR	NR	NR
Arsenic	5.33	4.11	3.23	1.91	12.47	6.68
Barium	4.02	NR	3.31	5.91	NR	NR
Cadmium	29.84 ^a	NR	24.80 ^a	NR	NR	NR
Calcium	2.16	NR	NR	NR	NR	NR
Chromium	22.25	25.78	22.72	3.91	30.25	NR
Cobalt	33.90	NR	NR	NR	NR	NR
Copper	7.03	9.11	8.49	9.12	12.77	14.86
Iron	1.78	1.67	1.55	NR	2.30	NR
Lead	6.45	5.93	5.05	7.56	6.97	12.16
Manganese	27.04	24.75	NR	NR	NR	NR
Molybdenum	6.95	NR	NR	NR	12.60	NR
Nickel	30.85 ^a	NR	24.92 ^a	20.92 ^a	NA	NR
Potassium	3.90	NR	NR	NR	NR	NR
Rubidium	13.06	NR	NR	NR	32.69 ^a	NR
Strontium	4.28	NR	NR	NR	8.86	NR
Tin	24.32 ^a	NR	NR	NR	NR	NR
Titanium	4.87	NR	NR	NR	NR	NR
Zinc	7.27	7.48	4.26	2.28	10.95	0.83
Zirconium	3.58	NR	NR	NR	6.49	NR

Source: Reference 4

^a These values are biased high because the concentration of these analytes in the soil samples was near the detection limit for that particular FPXRF instrument.

NR Not reported.

NA Not applicable; analyte was reported but was below the method detection limit.

TABLE 6
PRECISION AS AFFECTED BY SAMPLE PREPARATION

Analyte	Average Relative Standard Deviation for Each Preparation Method		
	In Situ-Field	Intrusive- Undried and Unground	Intrusive- Dried and Ground
Antimony	30.1	15.0	14.4
Arsenic	22.5	5.36	3.76
Barium	17.3	3.38	2.90
Cadmium ^a	41.2	30.8	28.3
Calcium	17.5	1.68	1.24
Chromium	17.6	28.5	21.9
Cobalt	28.4	31.1	28.4
Copper	26.4	10.2	7.90
Iron	10.3	1.67	1.57
Lead	25.1	8.55	6.03
Manganese	40.5	12.3	13.0
Mercury	ND	ND	ND
Molybdenum	21.6	20.1	19.2
Nickel ^a	29.8	20.4	18.2
Potassium	18.6	3.04	2.57
Rubidium	29.8	16.2	18.9
Selenium	ND	20.2	19.5
Silver ^a	31.9	31.0	29.2
Strontium	15.2	3.38	3.98
Thallium	39.0	16.0	19.5
Thorium	NR	NR	NR
Tin	ND	14.1	15.3
Titanium	13.3	4.15	3.74
Vanadium	NR	NR	NR
Zinc	26.6	13.3	11.1
Zirconium	20.2	5.63	5.18

Source: Reference 4

^a These values may be biased high because the concentration of these analytes in the soil samples was near the detection limit.

ND Not detected.

NR Not reported.

TABLE 7
ACCURACY

Analyte	Instrument															
	TN 9000				TN Lead Analyzer				X-MET 920 (SiLi Detector)				XL Spectrum Analyzer			
	n	Range of % Rec.	Mean % Rec.	SD	n	Range of % Rec.	Mean % Rec.	SD	n	Range of % Rec.	Mean % Rec.	SD	n	Range of % Rec.	Mean % Rec.	SD
Sb	2	100-149	124.3	NA	--	--	--	--	--	--	--	--	--	--	--	--
As	5	68-115	92.8	17.3	5	44-105	83.4	23.2	4	9.7-91	47.7	39.7	5	38-535	189.8	206
Ba	9	98-198	135.3	36.9	--	--	--	--	9	18-848	168.2	262	--	--	--	--
Cd	2	99-129	114.3	NA	--	--	--	--	6	81-202	110.5	45.7	--	--	--	--
Cr	2	99-178	138.4	NA	--	--	--	--	7	22-273	143.1	93.8	3	98-625	279.2	300
Cu	8	61-140	95.0	28.8	6	38-107	79.1	27.0	11	10-210	111.8	72.1	8	95-480	203.0	147
Fe	6	78-155	103.7	26.1	6	89-159	102.3	28.6	6	48-94	80.4	16.2	6	26-187	108.6	52.9
Pb	11	66-138	98.9	19.2	11	68-131	97.4	18.4	12	23-94	72.7	20.9	13	80-234	107.3	39.9
Mn	4	81-104	93.1	9.70	3	92-152	113.1	33.8	--	--	--	--	--	--	--	--
Ni	3	99-122	109.8	12.0	--	--	--	--	--	--	--	--	3	57-123	87.5	33.5
Sr	8	110-178	132.6	23.8	--	--	--	--	--	--	--	--	7	86-209	125.1	39.5
Zn	11	41-130	94.3	24.0	10	81-133	100.0	19.7	12	46-181	106.6	34.7	11	31-199	94.6	42.5

Source: Reference 4

n Number of samples that contained a certified value for the analyte and produced a detectable concentration from the FPXRF instrument.
SD Standard deviation.
NA Not applicable; only two data points, therefore, a SD was not calculated.
%Rec. Percent recovery.
-- No data.

TABLE 8
ACCURACY FOR TN 9000^a

Standard Reference Material	Arsenic			Barium			Copper			Lead			Zinc		
	Cert. Conc.	Meas. Conc.	%Rec.	Cert. Conc.	Meas. Conc.	%Rec.	Cert. Conc.	Meas. Conc.	%Rec.	Cert. Conc.	Meas. Conc.	%Rec.	Cert. Conc.	Meas. Conc.	%Rec.
RTC CRM-021	24.8	ND	NA	586	1135	193.5	4792	2908	60.7	144742	149947	103.6	546	224	40.9
RTC CRM-020	397	429	92.5	22.3	ND	NA	753	583	77.4	5195	3444	66.3	3022	3916	129.6
BCR CRM 143R	--	--	--	--	--	--	131	105	80.5	180	206	114.8	1055	1043	99.0
BCR CRM 141	--	--	--	--	--	--	32.6	ND	NA	29.4	ND	NA	81.3	ND	NA
USGS GXR-2	25.0	ND	NA	2240	2946	131.5	76.0	106	140.2	690	742	107.6	530	596	112.4
USGS GXR-6	330	294	88.9	1300	2581	198.5	66.0	ND	NA	101	80.9	80.1	118	ND	NA
NIST 2711	105	104	99.3	726	801	110.3	114	ND	NA	1162	1172	100.9	350	333	94.9
NIST 2710	626	722	115.4	707	782	110.6	2950	2834	96.1	5532	5420	98.0	6952	6476	93.2
NIST 2709	17.7	ND	NA	968	950	98.1	34.6	ND	NA	18.9	ND	NA	106	98.5	93.0
NIST 2704	23.4	ND	NA	414	443	107.0	98.6	105	106.2	161	167	103.5	438	427	97.4
CNRC PACS-1	211	143	67.7	--	772	NA	452	302	66.9	404	332	82.3	824	611	74.2
SARM-51	--	--	--	335	466	139.1	268	373	139.2	5200	7199	138.4	2200	2676	121.6
SARM-52	--	--	--	410	527	128.5	219	193	88.1	1200	1107	92.2	264	215	81.4

Source: Reference 4

^a All concentrations in milligrams per kilogram.
 %Rec. Percent recovery.
 ND Not detected.
 NA Not applicable.
 -- No data.

TABLE 9
REGRESSION PARAMETERS FOR COMPARABILITY¹

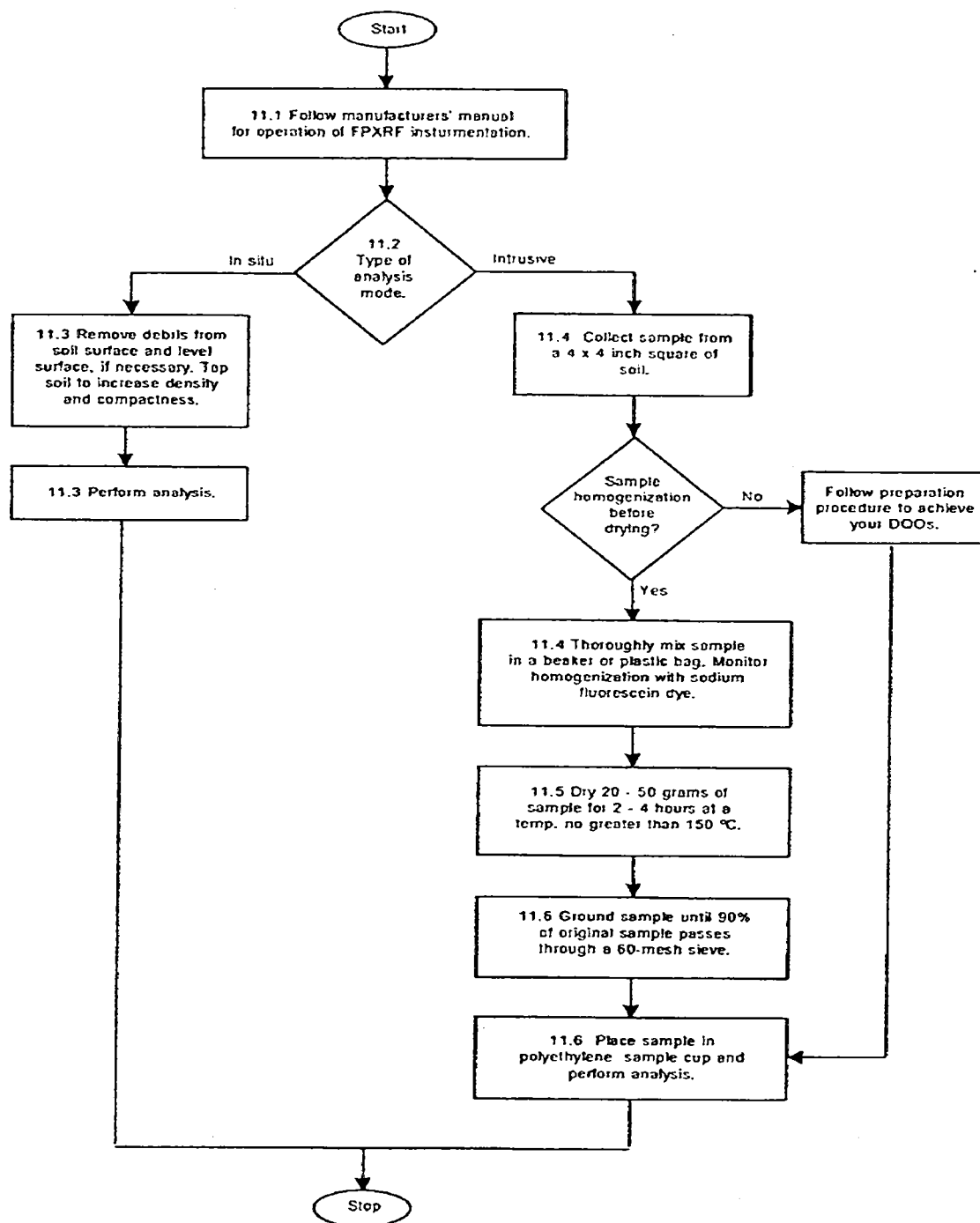
	Arsenic				Barium				Copper			
	n	r ²	Int.	Slope	n	r ²	Int.	Slope	n	r ²	Int.	Slope
All Data	824	0.94	1.62	0.94	1255	0.71	60.3	0.54	984	0.93	2.19	0.93
Soil 1	368	0.96	1.41	0.95	393	0.05	42.6	0.11	385	0.94	1.26	0.99
Soil 2	453	0.94	1.51	0.96	462	0.56	30.2	0.66	463	0.92	2.09	0.95
Soil 3	—	—	—	—	400	0.85	44.7	0.59	136	0.46	16.60	0.57
Prep 1	207	0.87	2.69	0.85	312	0.64	53.7	0.55	256	0.87	3.89	0.87
Prep 2	208	0.97	1.38	0.95	315	0.67	64.6	0.52	246	0.96	2.04	0.93
Prep 3	204	0.96	1.20	0.99	315	0.78	64.6	0.53	236	0.97	1.45	0.99
Prep 4	205	0.96	1.45	0.98	313	0.81	58.9	0.55	246	0.96	1.99	0.96

	Lead				Zinc				Chromium			
	n	r ²	Int.	Slope	n	r ²	Int.	Slope	n	r ²	Int.	Slope
All Data	1205	0.92	1.66	0.95	1103	0.89	1.86	0.95	280	0.70	64.6	0.42
Soil 1	357	0.94	1.41	0.96	329	0.93	1.78	0.93	—	—	—	—
Soil 2	451	0.93	1.62	0.97	423	0.85	2.57	0.90	—	—	—	—
Soil 3	397	0.90	2.40	0.90	351	0.90	1.70	0.98	186	0.66	38.9	0.50
Prep 1	305	0.80	2.88	0.86	286	0.79	3.16	0.87	105	0.80	66.1	0.43
Prep 2	298	0.97	1.41	0.96	272	0.95	1.86	0.93	77	0.51	81.3	0.36
Prep 3	302	0.98	1.26	0.99	274	0.93	1.32	1.00	49	0.73	53.7	0.45
Prep 4	300	0.96	1.38	1.00	271	0.94	1.41	1.01	49	0.75	31.6	0.56

Source: Reference 4

- ¹ Log-transformed data
n Number of data points
r² Coefficient of determination
Int. Y-intercept
— No applicable data

METHOD 6200

FIELD PORTABLE X-RAY FLUORESCENCE SPECTROMETRY FOR THE
DETERMINATION OF ELEMENTAL CONCENTRATIONS IN SOIL AND SEDIMENT

APPENDIX 4
DATA VALIDATION PACKAGE

STANDARD OPERATING PROCEDURE

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment Narrative

Page 1 of 4
Date: March 2003
Number: HW-2
Revision: 12

CASE: 34156	SITE: MATTEO & SON, INC.	SOIL: 20
SDG: MB1ZT0	LAB: CEIMIC	WATER: 0
CONTRACTOR: W-RST	REVIEWER: J. BULICH / ESAT	OTHER: 0

A. VALIDATION flags -The following flags have been applied in red by the data validator and must be considered by the data user.

J -This flag indicates the result qualified as **estimated**.

Red-Line -A red-line drawn through a sample result indicates **unusable** value. The red-lined data are known to contain significant errors based on documented information and must not be used by the data user.

Fully Usable Data -The results that do not carry "J" or "red-line" are fully usable.

Contractual Qualifiers -The legend of contractual qualifiers applied by the lab on Form I's is found on page B-24 of SOW ILM05.2

A.2.2. The data assessment is given below and on the attached sheets.

This case consists of twenty (20) soil samples collected at the Matteo & Son, Inc. between 4/27/05 and 4/29/05 for TAL metals, mercury and cyanide analysis according to the USEPA CLP SOW No. ILM05.3. Samples MB1ZT3/MB1ZT9 were the field duplicate pair for this sampling event. Matrix spike, laboratory duplicate and serial dilution analyses were performed on sample MB1ZT6.

As per EPA Technical Direction Form (TDF) only the following criteria were reviewed by the validator: Holding Time, CRQL Standard, Matrix Spike (soil), ICS, Laboratory Duplicate, Field Duplicate, ICP Serial Dilution, and Field Blank. The qualifiers applied on Form Is and CADRE EXCEL spreadsheets were based on ESAT data review of the above-mentioned criteria. For all other criteria see the attached CADRE reports.

ICP INTERFERENCE CHECK SAMPLE

The ICP Interference Check Sample recovery was outside the control limits of $\pm 20\%$ of true or established mean value of Se (188, 193 & 206%) & TI (125, 122 & 125%) in the ICS AB solution when the sample concentration of Fe was more than 50% of the respective concentration in the ICS AB Solution. All associated positive results for TI have been considered estimated and flagged "J". All associated positive results for Se have been flagged "R".

"J": TI —> MB1ZT4 & MB1ZT5.

"R": Se —> MB1ZT5.

STANDARD OPERATING PROCEDURE

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment Narrative

Page 3 of 4
Date: March 2003
Number: HW-2
Revision: 12

A.2.2. (continuation)

ICP SERIAL DILUTION

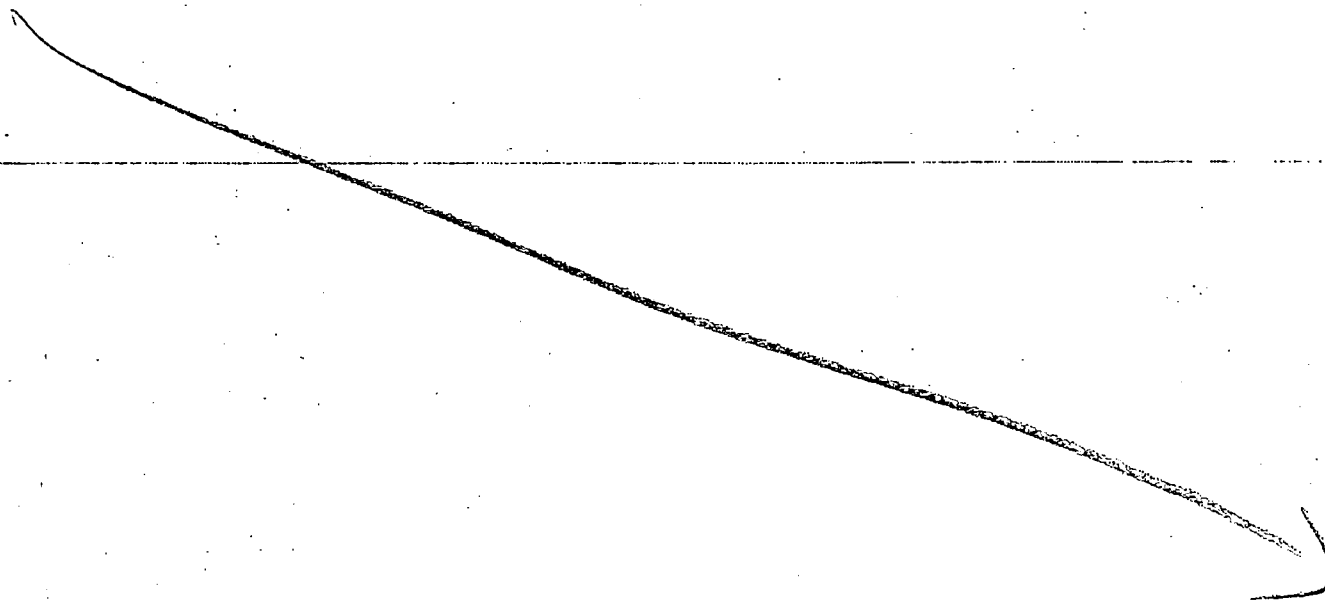
The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 50 X MDL for Co (%D = 12). All associated sample results greater than MDL have been considered estimated and flagged "J".

"J": Co —> MB1ZT0 —> MB1ZT9 & MB1ZW0 —> MB1ZW9.

PERCENT SOLIDS

The percent solids was less than 50 but greater than 10 for sample MB1ZT1 (33%). All sample results not previously qualified have been considered estimated and flagged "J".

"J": —> all analytes not previously qualified in MB1ZT1.



STANDARD OPERATING PROCEDURE

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment Narrative

Page 5 of 4
Date: March 2003
Number: HW-2
Revision: 12

CONTRACT NON-COMPLIANCE
(SMO REPORT)

Region Review of Uncontrolled Hazardous Waste
Site contract Laboratory Data Package

CASE NO. 34156

The hard copied (laboratory name) CEIMIC

Inorganic data package received at Region II has been reviewed and the quality assurance and performance data summarized. The data reviewed included:

SMO Sample No.: _____

Conc. & Matrix: _____

Contract No. (_____) requires that specific analytical work be done and that associated reports be provided by the contractor to the Regions, EMSL-LV, and SMO. The general criteria used to determine the performance were based on an examination of:

- | | |
|---------------------------------|------------------------------|
| - Data Completeness | - Duplicate Analysis Results |
| - Matrix Spike Results | - Blank Analysis Results |
| - Calibration Standards Results | - MSA Results |

Items of non-compliance with the above contract are described below.

Comments: N/A

JB
Reviewer's Initial

6/02/05
Date

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MAY 26 2005

COVER PAGE

HAZ. WASTE SUPPORT SEC.

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No: 34156 NRAS No.: SDG No: MB1ZT0
 SOW No.: ILM05.3

EPA Sample No.	Lab Sample ID
MB1ZT0	050419-01
MB1ZT1	050419-02
MB1ZT2	050419-03
MB1ZT3	050419-04
MB1ZT4	050419-05
MB1ZT5	050419-06
MB1ZT6	050419-07
MB1ZT6D	050419-07D
MB1ZT6S	050419-07S
MB1ZT7	050419-08
MB1ZT8	050419-09
MB1ZT9	050419-10
MB1ZW0	050419-11
MB1ZW1	050419-12
MB1ZW2	050419-13
MB1ZW3	050419-14
MB1ZW4	050419-15
MB1ZW5	050419-16
MB1ZW6	050419-17
MB1ZW7	050419-18

Were ICP-AES and ICP-MS interelement corrections applied?

(Yes/No)

ICP-AES

ICP-MS

YES

NO

Were ICP-AES and ICP-MS background corrections applied?

(Yes/No)

YES

NO

If yes, were raw data generated before application of background corrections?

(Yes/No)

NO

NO

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette (or via an alternate means of electronic transmission, if approved in advance by USEPA) has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature:

Name:

Ryan Montalbano

Date:

Title:

Inorganic Lab Supervisor

0001

Lab Name:	<u>Ceimic Corporation</u>	Contract:	<u>68-W-02-063</u>
Lab Code:	<u>CEIMIC</u>	Case No:	<u>34156</u>
		NRAS No.:	<u> </u>
		SDG No:	<u>MB1ZT0</u>
SOW No.:	<u>ILM05.3</u>		

050419-20

NO

NO

NO

ILM05.3000

RECEIVED

MAY 26 2005

HAZ. WASTE SUPPORT SEC.

SDG Narrative

Laboratory Name: Ceimic Corporation

Case No.: 34156

SDG No.: MB1ZT0

Contract: 68W02063

Ceimic Project No.: 050419

The following ILM05.3 (ICP-AES) twenty soil samples were received at Ceimic Corporation on April 15, 2005:

<u>EPA ID</u>	<u>Ceimic ID</u>
MB1ZT0	050419-01
MB1ZT1	050419-02
MB1ZT2	050419-03
MB1ZT3	050419-04
MB1ZT4	050419-05
MB1ZT5	050419-06
MB1ZT6	050419-07
MB1ZT6D	050419-07D
MB1ZT6S	050419-07S
MB1ZT7	050419-08
MB1ZT8	050419-09
MB1ZT9	050419-10
MB1ZW0	050419-11
MB1ZW1	050419-12
MB1ZW2	050419-13
MB1ZW3	050419-14
MB1ZW4	050419-15
MB1ZW5	050419-16
MB1ZW6	050419-17
MB1ZW7	050419-18
MB1ZW8	050419-19
MB1ZW9	050419-20

Comments on Data Package:

The Traffic Reports / Chains of Custody (TR/COCs) for for Case 34156 indicated that the samples were received for Total Metals analysis. This differed from the Scheduling Notification Form, which indicated that samples were to be received for Total Metals analysis by ICP-AES, for Total Mercury analysis by CVAA, and for Total Cyanide analysis by automated spectrophotometry. After consultation with Mike Benhoff of the Sample Management Office, the samples were processed for the analyses indicated on the Scheduling Notification Form (Total Metals / Mercury / Cyanide).

0003

The samples were prepared and analyzed in accordance with the Inorganic Statement of Work (SOW) ILM05.3.

When ICP-AES and CVAA raw data have been reprocessed in an SDG, the words "Reprocessed on" followed by the date and time of reprocessing will sometimes be printed in the header of each standard and sample raw data report. The word "Reprocessed" is used when the original sequence data is regenerated after it was collected and processed with incorrect information (such as sample information, standard nomenclature) or settings (such as background correction, internal standard, dilution factor, QC concentration, wrong IEC table, etc.)

QA/QC Samples:

Matrix spike and duplicate analysis – as well as ICP fivefold serial dilution – were performed on sample MB1ZT6 as indicated on the TR/COC. A post-digestion spike was required for Antimony and Selenium due to low recoveries in the matrix spike sample. Mercury recovery was high in the matrix spike sample; however, the SOW ILM05.3 does not require a post-digestion spike for this analyte.

Observations:

A "U" flag in the C column on the Form IA-IN or any other form indicates that the concentration of that analyte in the sample is undetected at the experimentally-determined method detection limit (MDL). If any analyte is detected at a concentration between the Contract Required Quantitation Limit (CRQL) and the MDL, a "J" flag is shown in the C column on the form.

The "N" qualifier applies to Sb, Hg and Se for the matrix spike recoveries outside of QC limits. The "*" qualifier applies to Al, Ba, Pb, Hg and Ni for high concentration difference between sample MB1ZT6 and its duplicate. The "E" qualifier applies to Cobalt for high concentration difference between sample MB1ZT6 and its serial dilution.

Lead is detected in samples MB1ZT1 and MB1ZT4 at concentrations exceeding the experimentally-determined linear range of the ICP-AES instrument. The sample digestates were diluted and reanalyzed; this reanalysis is indicated by a "D" qualifier on the Form IA-IN.

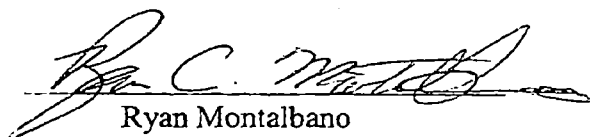
Due to a software limitation, please note that all ICP-AES target analytes are reported on the Form IIB-IN for the CRQL Check (CRI) standard, even though seven target analytes (Al, Ba, Ca, Fe, Mg, K, Na) do not require such monitoring.

Deviations from Contract:

None.

End of SDG Narrative.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.



Ryan Montalbano
Supervisor, Inorganic Laboratories

05/25/2005

Date

SAMPLE DELIVERY GROUP (SDG)
TRAFFIC REPORT (TR) COVERSHEETRECEIVED
MAY 26 2005

HAZ. WASTE SUPPORT SEC.

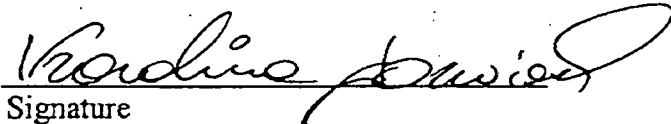
Lab Name: Ceimic CorporationLab Code: CEIMICCase No.: 34156Bid Lot: BContract No: 68W02063

Full Sample Analysis Price: _____

First Sample in SDG: MB1ZT0Sample Receipt Date: 4/30/2005*(Lowest EPA Sample Number in the first
shipment of samples received under SDG.)*Last Sample in SDG: MB1ZW9Sample Receipt Date: 4/30/2005*(Highest EPA Sample Number in the last
shipment of samples received under SDG.)*

EPA Sample Numbers in the SDG (listed in alphanumeric order by date received)

- | | |
|------------|------------|
| 1. MB1ZT0 | 11. MB1ZW0 |
| 2. MB1ZT1 | 12. MB1ZW1 |
| 3. MB1ZT2 | 13. MB1ZW2 |
| 4. MB1ZT3 | 14. MB1ZW3 |
| 5. MB1ZT4 | 15. MB1ZW4 |
| 6. MB1ZT5 | 16. MB1ZW5 |
| 7. MB1ZT6 | 17. MB1ZW6 |
| 8. MB1ZT7 | 18. MB1ZW7 |
| 9. MB1ZT8 | 19. MB1ZW8 |
| 10. MB1ZT9 | 20. MB1ZW9 |

*Note: There are a maximum of 20 field samples in an SDG.*Attach Traffic Reports to this form in alphanumeric order by date received.
(i.e. The order listed on this form)
Signature
Date

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT0

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-01
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 79.0
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1490		✓ J	P
7440-36-0	Antimony	3.3	✓	✓ J	P
7440-38-2	Arsenic	3.2			P
7440-39-3	Barium	22.4	J	✓	P
7440-41-7	Beryllium	0.15	J		P
7440-43-9	Cadmium	0.33	J		P
7440-70-2	Calcium	670			P
7440-47-3	Chromium	13.5			P
7440-48-4	Cobalt	2.7	✓	✓ J	P
7440-50-8	Copper	16.1			P
7439-89-6	Iron	5440			P
7439-92-1	Lead	153		✓ J	P
7439-95-4	Magnesium	245	J		P
7439-96-5	Manganese	48.7			P
7439-97-6	Mercury	0.081	✓	✓ J	CV
7440-02-0	Nickel	3.3	J	✓	P
7440-09-7	Potassium	206	J		P
7782-49-2	Selenium	3.9	✓	✓	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	55.4	✓		P
7440-28-0	Thallium	2.8	U		P
7440-62-2	Vanadium	11.2			P
7440-66-6	Zinc	58.8			P
57-12-5	Cyanide	0.44	J		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT1

Lab Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156NRAS No.: _____ SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-02Level (low/med): LOWDate Received: 04/30/2005Solids: 33.2

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700		J	P
7440-36-0	Antimony	71.8		J	P
7440-38-2	Arsenic	32.3		J	P
7440-39-3	Barium	162		J	P
7440-41-7	Beryllium	1.4		J	P
7440-43-9	Cadmium	3.7		J	P
7440-70-2	Calcium	8800		J	P
7440-47-3	Chromium	89.8		J	P
7440-48-4	Cobalt	16.5		J	P
7440-50-8	Copper	216		J	P
7439-89-6	Iron	61800		J	P
7439-92-1	Lead	27900		J	P
7439-95-4	Magnesium	3740		J	P
7439-96-5	Manganese	1870		J	P
7439-97-6	Mercury	0.96		J	CV
7440-02-0	Nickel	61.4		J	P
7440-09-7	Potassium	1250	X	J	P
7782-49-2	Selenium	9.2	U	J	P
7440-22-4	Silver	2.6	U	J	P
7440-23-5	Sodium	295	U	J	P
7440-28-0	Thallium	6.6	U	J	P
7440-62-2	Vanadium	75.6		J	P
7440-66-6	Zinc	580		J	P
57-12-5	Cyanide	0.57	X	J	AS

Color Before: brown Clarity Before: n/a Texture: mediumColor After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT2

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-03
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 85.4
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2890		N J	P
7440-36-0	Antimony	6.2	U	N J	P
7440-38-2	Arsenic	4.2			P
7440-39-3	Barium	23.6		N	P
7440-41-7	Beryllium	0.24	J		P
7440-43-9	Cadmium	0.17	J		P
7440-70-2	Calcium	1290			P
7440-47-3	Chromium	7.8			P
7440-48-4	Cobalt	1.2	N	N J	P
7440-50-8	Copper	5.3			P
7439-89-6	Iron	5550			P
7439-92-1	Lead	43.0		N J	P
7439-95-4	Magnesium	465	J		P
7439-96-5	Manganese	114			P
7439-97-6	Mercury	0.097	N	N J	CV
7440-02-0	Nickel	3.8	J	N	P
7440-09-7	Potassium	294	J		P
7782-49-2	Selenium	3.6 U	N	N	P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	23.1 J	N		P
7440-28-0	Thallium	2.6	U		P
7440-62-2	Vanadium	11.7			P
7440-66-6	Zinc	41.5			P
57-12-5	Cyanide	2.9	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT3

b Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156

NRAS No.: _____

SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-04Level (low/med): LOWDate Received: 04/30/2005Solids: 89.2

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1820		X J	P
7440-36-0	Antimony	4.3	X	X J	P
7440-38-2	Arsenic	9.9			P
7440-39-3	Barium	30.5		/	P
7440-41-7	Beryllium	0.17	J		P
7440-43-9	Cadmium	1.7			P
7440-70-2	Calcium	1010			P
7440-47-3	Chromium	9.8			P
7440-48-4	Cobalt	1.5	X	X J	P
7440-50-8	Copper	28.1			P
7439-89-6	Iron	17800			P
7439-92-1	Lead	633		/ J	P
7439-95-4	Magnesium	406	J		P
7439-96-5	Manganese	171			P
7439-97-6	Mercury	0.18		X J	CV
7440-02-0	Nickel	12.6		/	P
7440-09-7	Potassium	224	J		P
7782-49-2	Selenium	3.8	U	/	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	49.3	J		P
7440-28-0	Thallium	2.7	U		P
7440-62-2	Vanadium	8.6			P
7440-66-6	Zinc	136			P
57-12-5	Cyanide	2.8	U		AS

Color Before: brownClarity Before: n/aTexture: mediumColor After: yellowClarity After: n/a

Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT4

Lab Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156NRAS No.: _____ SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-05Level (low/med): LOWDate Received: 04/30/2005Solids: 77.7Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3530		X J	P
7440-36-0	Antimony	31.9		X J	P
7440-38-2	Arsenic	25.7			P
7440-39-3	Barium	243		X	P
7440-41-7	Beryllium	0.27	J		P
7440-43-9	Cadmium	5.1			P
7440-70-2	Calcium	6140			P
7440-47-3	Chromium	42.6			P
7440-48-4	Cobalt	4.6	X	X J	P
7440-50-8	Copper	296			P
7439-89-6	Iron	48200			P
7439-92-1	Lead	15100		X J	P
7439-95-4	Magnesium	1970			P
7439-96-5	Manganese	339			P
7439-97-6	Mercury	2.8		X J	CV
7440-02-0	Nickel	40.6		X	P
7440-09-7	Potassium	486	J		P
7782-49-2	Selenium	4.1	U	X	P
7440-22-4	Silver	1.2	U		P
7440-23-5	Sodium	101	J		P
7440-28-0	Thallium	1.2	X	J	P
7440-62-2	Vanadium	28.0			P
7440-66-6	Zinc	783			P
57-12-5	Cyanide	0.07	J		AS

Color Before: brown Clarity Before: n/a Texture: mediumColor After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT5

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-06
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 99.4
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1790		J	P
7440-36-0	Antimony	0.40	X	X J	P
7440-38-2	Arsenic	2.3			P
7440-39-3	Barium	21.4			P
7440-41-7	Beryllium	0.18	J		P
7440-43-9	Cadmium	0.33	J		P
7440-70-2	Calcium	33700			P
7440-47-3	Chromium	16.9			P
7440-48-4	Cobalt	1.7	X	X J	P
7440-50-8	Copper	176			P
7439-89-6	Iron	6670			P
7439-92-1	Lead	291		X J	P
7439-95-4	Magnesium	19500			P
7439-96-5	Manganese	137			P
7439-97-6	Mercury	0.062	X	X J	CV
7440-02-0	Nickel	18.5			P
7440-09-7	Potassium	381	J		P
7782-49-2	Selenium	8.5		X	P
7440-22-4	Silver	0.92	U		P
7440-23-5	Sodium	124			P
7440-28-0	Thallium	0.52	X	J	P
7440-62-2	Vanadium	9.3			P
7440-66-6	Zinc	98.9			P
57-12-5	Cyanide	2.5	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT6

Lab Name: Ceimic Corporation Contract: 68-W-02-063

Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0

Matrix (soil/water): SOIL Lab Sample ID: 050419-07

Level (low/med): LOW Date Received: 04/30/2005

Solids: 81.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4700		N J	P
7440-36-0	Antimony	9.1		N J	P
7440-38-2	Arsenic	16.7			P
7440-39-3	Barium	120		N	P
7440-41-7	Beryllium	0.24	J		P
7440-43-9	Cadmium	0.71			P
7440-70-2	Calcium	1110			P
7440-47-3	Chromium	98.6			P
7440-48-4	Cobalt	3.8	N	N J	P
7440-50-8	Copper	303			P
7439-89-6	Iron	36600			P
7439-92-1	Lead	3850		N J	P
7439-95-4	Magnesium	475	J		P
7439-96-5	Manganese	171			P
7439-97-6	Mercury	0.60		N J	CV
7440-02-0	Nickel	15.4		N	P
7440-09-7	Potassium	348	J		P
7782-49-2	Selenium	3.9	U	N	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	58.2	J		P
7440-28-0	Thallium	2.8	U		P
7440-62-2	Vanadium	18.4			P
7440-66-6	Zinc	328			P
57-12-5	Cyanide	0.72	J		AS

Color Before: brown Clarity Before: n/a Texture: medium

Color After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT7

Name: Ceimic Corporation Contract: 68-W-02-063
 Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-08
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 80.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3910		X J	P
7440-36-0	Antimony	3.4	X	X J	P
7440-38-2	Arsenic	6.5			P
7440-39-3	Barium	55.2		X	P
7440-41-7	Beryllium	0.29	J		P
7440-43-9	Cadmium	1.1			P
7440-70-2	Calcium	3420			P
7440-47-3	Chromium	41.7			P
7440-48-4	Cobalt	3.0	X	X J	P
7440-50-8	Copper	75.6			P
7439-89-6	Iron	13400			P
7439-92-1	Lead	765		X J	P
7439-95-4	Magnesium	1200			P
7439-96-5	Manganese	139			P
7439-97-6	Mercury	1.0		X J	CV
7440-02-0	Nickel	28.4		X	P
7440-09-7	Potassium	561			P
7782-49-2	Selenium	3.7	U	X	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	62.7	J		P
7440-28-0	Thallium	2.7	U		P
7440-62-2	Vanadium	19.8			P
7440-66-6	Zinc	191			P
57-12-5	Cyanide	3.1	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT8

Lab Name: Ceimic Corporation Contract: 68-W-02-063

Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0

Matrix (soil/water): SOIL Lab Sample ID: 050419-09

Level (low/med): LOW Date Received: 04/30/2005

Solids: 93.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2820		1 J	P
7440-36-0	Antimony	0.51	1	1 J	P
7440-38-2	Arsenic	3.8			P
7440-39-3	Barium	30.1		1	P
7440-41-7	Beryllium	0.21	J		P
7440-43-9	Cadmium	0.40	J		P
7440-70-2	Calcium	1570			P
7440-47-3	Chromium	8.8			P
7440-48-4	Cobalt	2.4	1	1 J	P
7440-50-8	Copper	19.3			P
7439-89-6	Iron	7050			P
7439-92-1	Lead	183		1 J	P
7439-95-4	Magnesium	683			P
7439-96-5	Manganese	109			P
7439-97-6	Mercury	0.39		1 J	CV
7440-02-0	Nickel	5.9		1	P
7440-09-7	Potassium	300	J		P
7782-49-2	Selenium	3.4	U	1	P
7440-22-4	Silver	0.98	U		P
7440-23-5	Sodium	48.0	J		P
7440-28-0	Thallium	2.5	U		P
7440-62-2	Vanadium	12.3			P
7440-66-6	Zinc	107			P
57-12-5	Cyanide	2.7	U		AS

Color Before: brown Clarity Before: n/a Texture: medium

Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZT9

Lab Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156NRAS No.: _____ SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-10Level (low/med): LOWDate Received: 04/30/2005Solids: 87.7

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2590		X J	P
7440-36-0	Antimony	6.0	X	X J	P
7440-38-2	Arsenic	9.0			P
7440-39-3	Barium	35.6		/	P
7440-41-7	Beryllium	0.23	J		P
7440-43-9	Cadmium	1.3			P
7440-70-2	Calcium	1250			P
7440-47-3	Chromium	13.5			P
7440-48-4	Cobalt	1.6	X	X J	P
7440-50-8	Copper	26.0			P
7439-89-6	Iron	14100			P
7439-92-1	Lead	622		X J	P
7439-95-4	Magnesium	529	J		P
7439-96-5	Manganese	157			P
7439-97-6	Mercury	0.15		X J	CV
7440-02-0	Nickel	9.0		/	P
7440-09-7	Potassium	294	J		P
7782-49-2	Selenium	3.6	U	/	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	29.3	J		P
7440-28-0	Thallium	2.7	U		P
7440-62-2	Vanadium	10.7			P
7440-66-6	Zinc	93.4			P
57-12-5	Cyanide	2.9	U		AS

Color Before: brown Clarity Before: n/a Texture: mediumColor After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW0

b Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-11
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 84.6
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3210		J	P
7440-36-0	Antimony	5.4	X	X J	P
7440-38-2	Arsenic	5.2			P
7440-39-3	Barium	44.1		J	P
7440-41-7	Beryllium	0.28	J		P
7440-43-9	Cadmium	0.71			P
7440-70-2	Calcium	1960			P
7440-47-3	Chromium	14.0			P
7440-48-4	Cobalt	1.9	X	X J	P
7440-50-8	Copper	66.5			P
7439-89-6	Iron	8840			P
7439-92-1	Lead	1400		J	P
7439-95-4	Magnesium	684			P
7439-96-5	Manganese	133			P
7439-97-6	Mercury	0.26		X J	CV
7440-02-0	Nickel	8.5		J	P
7440-09-7	Potassium	348	J		P
7782-49-2	Selenium	3.7 8		X	P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	58.1 J			P
7440-28-0	Thallium	2.6	U		P
7440-62-2	Vanadium	17.8			P
7440-66-6	Zinc	154			P
57-12-5	Cyanide	3.0	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW1

Lab Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156NRAS No.: _____ SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-12Level (low/med): LOWDate Received: 04/30/2005Solids: 68.6

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4860		J	P
7440-36-0	Antimony	11.3		N J	P
7440-38-2	Arsenic	9.5			P
7440-39-3	Barium	40.9		/	P
7440-41-7	Beryllium	0.39	J		P
7440-43-9	Cadmium	0.63	J		P
7440-70-2	Calcium	1110			P
7440-47-3	Chromium	18.2			P
7440-48-4	Cobalt	2.2	X	N J	P
7440-50-8	Copper	30.6			P
7439-89-6	Iron	10500			P
7439-92-1	Lead	1520		N J	P
7439-95-4	Magnesium	722			P
7439-96-5	Manganese	81.5			P
7439-97-6	Mercury	0.19		N J	CV
7440-02-0	Nickel	10.8		/	P
7440-09-7	Potassium	580	J		P
7782-49-2	Selenium	4.9	U	X	P
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	186	X	J	P
7440-28-0	Thallium	3.5	U		P
7440-62-2	Vanadium	29.2			P
7440-66-6	Zinc	138			P
57-12-5	Cyanide	3.6	U		AS

Color Before: black Clarity Before: n/a Texture: mediumColor After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW2

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-13
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 79.4

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3380		X J	P
7440-36-0	Antimony	5.7	X	X J	P
7440-38-2	Arsenic	5.0			P
7440-39-3	Barium	34.5		/	P
7440-41-7	Beryllium	0.26	J		P
7440-43-9	Cadmium	0.78			P
7440-70-2	Calcium	2270			P
7440-47-3	Chromium	9.5			P
7440-48-4	Cobalt	1.5	X	X J	P
7440-50-8	Copper	18.4			P
7439-89-6	Iron	6410			P
7439-92-1	Lead	973		/ J	P
7439-95-4	Magnesium	644			P
7439-96-5	Manganese	94.4			P
7439-97-6	Mercury	0.14		X J	CV
7440-02-0	Nickel	7.6		/	P
7440-09-7	Potassium	414	J		P
7782-49-2	Selenium	4.2	U	X	P
7440-22-4	Silver	1.2	U		P
7440-23-5	Sodium	36.3	U		P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	12.4			P
7440-66-6	Zinc	85.1			P
57-12-5	Cyanide	3.1	U		AS

Color Before: black Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW3

Lab Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156NRAS No.: _____ SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-14Level (low/med): LOWDate Received: 04/30/2005Solids: 93.0Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	949		J	P
7440-36-0	Antimony	0.42	J	J	P
7440-38-2	Arsenic	0.86	J		P
7440-39-3	Barium	5.8	J	J	P
7440-41-7	Beryllium	0.12	J		P
7440-43-9	Cadmium	0.053	J		P
7440-70-2	Calcium	342	J		P
7440-47-3	Chromium	8.0			P
7440-48-4	Cobalt	0.87	J	J	P
7440-50-8	Copper	10.2			P
7439-89-6	Iron	2540			P
7439-92-1	Lead	18.1		J	P
7439-95-4	Magnesium	155	J		P
7439-96-5	Manganese	12.8			P
7439-97-6	Mercury	0.010	J	J	CV
7440-02-0	Nickel	1.9	J	J	P
7440-09-7	Potassium	196	J		P
7782-49-2	Selenium	3.2		J	P
7440-22-4	Silver	0.93	U		P
7440-23-5	Sodium	20.9	J		P
7440-28-0	Thallium	2.3	U		P
7440-62-2	Vanadium	9.1			P
7440-66-6	Zinc	73.5			P
57-12-5	Cyanide	2.7	U		AS

Color Before: brown Clarity Before: n/a Texture: mediumColor After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW4

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-15
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 96.4
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3220		J	P
7440-36-0	Antimony	5.6	U	J	P
7440-38-2	Arsenic	2.2			P
7440-39-3	Barium	8.8	J		P
7440-41-7	Beryllium	0.15	J		P
7440-43-9	Cadmium	0.046	J		P
7440-70-2	Calcium	84.2	J		P
7440-47-3	Chromium	7.3			P
7440-48-4	Cobalt	0.90	X	XJ	P
7440-50-8	Copper	5.4			P
7439-89-6	Iron	6670			P
7439-92-1	Lead	9.6		J	P
7439-95-4	Magnesium	341	J		P
7439-96-5	Manganese	16.1			P
7439-97-6	Mercury	0.010	X	XJ	CV
7440-02-0	Nickel	5.1			P
7440-09-7	Potassium	86.3	J		P
7782-49-2	Selenium	3.3	U	X	P
7440-22-4	Silver	0.94	U		P
7440-23-5	Sodium	15.6	J		P
7440-28-0	Thallium	2.3	U		P
7440-62-2	Vanadium	9.0			P
7440-66-6	Zinc	10.5			P
57-12-5	Cyanide	2.6	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW5

Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156

NRAS No.: _____

SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-16Level (low/med): LOWDate Received: 04/30/2005Solids: 88.6

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3020		X J	P
7440-36-0	Antimony	0.67	X	X J	P
7440-38-2	Arsenic	5.7			P
7440-39-3	Barium	47.5		X	P
7440-41-7	Beryllium	0.24	J		P
7440-43-9	Cadmium	1.1			P
7440-70-2	Calcium	4540			P
7440-47-3	Chromium	13.6			P
7440-48-4	Cobalt	2.0	X	X J	P
7440-50-8	Copper	24.3			P
7439-89-6	Iron	8540			P
7439-92-1	Lead	161		X J	P
7439-95-4	Magnesium	2120			P
7439-96-5	Manganese	91.6			P
7439-97-6	Mercury	0.087	X	X J	CV
7440-02-0	Nickel	9.2		X	P
7440-09-7	Potassium	426	J		P
7782-49-2	Selenium	3.3	U	X	P
7440-22-4	Silver	0.95	U		P
7440-23-5	Sodium	44.2	J		P
7440-28-0	Thallium	2.4	U		P
7440-62-2	Vanadium	12.8			P
7440-66-6	Zinc	189			P
57-12-5	Cyanide	2.8	U		AS

Color Before: brownClarity Before: n/aTexture: mediumColor After: yellowClarity After: n/a

Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW5

b Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-17
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 77.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4480		N J	P
7440-36-0	Antimony	2.3	N	N J	P
7440-38-2	Arsenic	6.2			P
7440-39-3	Barium	36.3		N	P
7440-41-7	Beryllium	0.40	J		P
7440-43-9	Cadmium	0.44	J		P
7440-70-2	Calcium	3780			P
7440-47-3	Chromium	15.3			P
7440-48-4	Cobalt	2.9	N	N J	P
7440-50-8	Copper	28.9			P
7439-89-6	Iron	8460			P
7439-92-1	Lead	410		N J	P
7439-95-4	Magnesium	1560			P
7439-96-5	Manganese	123			P
7439-97-6	Mercury	0.16		N J	CV
7440-02-0	Nickel	9.2		N	P
7440-09-7	Potassium	724			P
7782-49-2	Selenium	3.9	U	N	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	39.8	U		P
7440-28-0	Thallium	2.8	U		P
7440-62-2	Vanadium	17.6			P
7440-66-6	Zinc	87.2			P
57-12-5	Cyanide	3.2	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW7

Lab Name: Ceimic Corporation Contract: 68-W-02-063
 Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0
 Matrix (soil/water): SOIL Lab Sample ID: 050419-18
 Level (low/med): LOW Date Received: 04/30/2005
 Solids: 90.3
 Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4120		N J	P
7440-36-0	Antimony	5.9	U	N J	P
7440-38-2	Arsenic	9.3			P
7440-39-3	Barium	16.9	J	N	P
7440-41-7	Beryllium	0.53			P
7440-43-9	Cadmium	0.44	J		P
7440-70-2	Calcium	1720			P
7440-47-3	Chromium	48.1			P
7440-48-4	Cobalt	1.4	N	N J	P
7440-50-8	Copper	7.3			P
7439-89-6	Iron	17500			P
7439-92-1	Lead	25.2		N J	P
7439-95-4	Magnesium	584			P
7439-96-5	Manganese	49.4			P
7439-97-6	Mercury	0.037	N	N J	CV
7440-02-0	Nickel	3.7	J	N	P
7440-09-7	Potassium	1290			P
7782-49-2	Selenium	3.4	U	N	P
7440-22-4	Silver	0.98	U		P
7440-23-5	Sodium	56.3	N		P
7440-28-0	Thallium	2.5	U		P
7440-62-2	Vanadium	59.8			P
7440-66-6	Zinc	72.5			P
57-12-5	Cyanide	2.8	U		AS

Color Before: brown Clarity Before: n/a Texture: medium
 Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW8

Lab Name: Ceimic Corporation Contract: 68-W-02-063

Lab Code: CEIMIC Case No.: 34156 NRAS No.: _____ SDG NO.: MB1ZT0

Matrix (soil/water): SOIL Lab Sample ID: 050419-19

Level (low/med): LOW Date Received: 04/30/2005

Solids: 74.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5930		N J	P
7440-36-0	Antimony	6.9	U	N J	P
7440-38-2	Arsenic	9.2			P
7440-39-3	Barium	62.3		N	P
7440-41-7	Beryllium	0.61			P
7440-43-9	Cadmium	0.48	J		P
7440-70-2	Calcium	1530			P
7440-47-3	Chromium	26.1			P
7440-48-4	Cobalt	3.3	N	N J	P
7440-50-8	Copper	23.6			P
7439-89-6	Iron	12000			P
7439-92-1	Lead	80.6		N J	P
7439-95-4	Magnesium	1170			P
7439-96-5	Manganese	68.4			P
7439-97-6	Mercury	0.32		N J	CV
7440-02-0	Nickel	10.3		N	P
7440-09-7	Potassium	505	J		P
7782-49-2	Selenium	4.0	U	N	P
7440-22-4	Silver	1.2	U		P
7440-23-5	Sodium	111	J		P
7440-28-0	Thallium	2.9	U		P
7440-62-2	Vanadium	43.8			P
7440-66-6	Zinc	213			P
57-12-5	Cyanide	0.15	J		AS

Color Before: brown Clarity Before: n/a Texture: medium

Color After: yellow Clarity After: n/a Artifacts: _____

Comments:

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1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB1ZW9

Lab Name: Ceimic CorporationContract: 68-W-02-063Lab Code: CEIMIC Case No.: 34156NRAS No.: _____ SDG NO.: MB1ZT0Matrix (soil/water): SOILLab Sample ID: 050419-20Level (low/med): LOWDate Received: 04/30/2005Solids: 89.7

Concentration Units (ug/L or mg/kg dry weight):

MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5710		X J	P
7440-36-0	Antimony	0.61	X	X J	P
7440-38-2	Arsenic	11.3			P
7440-39-3	Barium	29.2		X	P
7440-41-7	Beryllium	0.50	J		P
7440-43-9	Cadmium	0.59			P
7440-70-2	Calcium	1240			P
7440-47-3	Chromium	51.6			P
7440-48-4	Cobalt	1.5	X	X J	P
7440-50-8	Copper	51.9			P
7439-89-6	Iron	15800			P
7439-92-1	Lead	93.5		X J	P
7439-95-4	Magnesium	878			P
7439-96-5	Manganese	56.4			P
7439-97-6	Mercury	0.10	X	N J	CV
7440-02-0	Nickel	5.9		X	P
7440-09-7	Potassium	1630			P
7782-49-2	Selenium	3.6	U	X	P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	39.2	J		P
7440-28-0	Thallium	2.6	U		P
7440-62-2	Vanadium	50.0			P
7440-66-6	Zinc	102			P
57-12-5	Cyanide	2.8	U		AS

Color Before: brown Clarity Before: n/a Texture: mediumColor After: yellow Clarity After: n/a Artifacts: _____

Comments: _____

Ryan Montalbano

From: Benhoff, Michael [mbenhoff@fedcsc.com]
Sent: Wednesday, May 04, 2005 10:04 AM
To: Beata Maczewska (E-mail); Kristen Riley (E-mail); Paul Frankson (E-mail); Ryan Montalbano (E-mail)
Cc: Adly Michael (E-mail); Jennifer Feranda (E-mail)
Subject: Region 02 | Case 34156 | Lab CEIMIC | Issue Multiple | FINAL

Hi Ryan:

Following are the resolutions to the issues below:

Laboratory problems

Issue 1: The lab received 20 samples for this Case, but was scheduled for 37 samples. The lab would like to know if the Case is complete.

Resolution 1: Per Region 2, this Case is complete.

Discrepancies with tags, jars, and/or TR/COC

Issue 2: The TR only indicates samples for TM analysis, but the lab was scheduled for TM/Hg/CN analysis.

Resolution 2: Per Region 2, the lab should proceed per the Scheduling Notification and note the issue in the SDG narrative.

Thanks,

Mike

Michael Benhoff
 Computer Sciences Corporation
 CLP Coordinator for Regions 1, 2, and 3
 michael.benhoff@dyncorp.com
 Phone: (703) 818-4357; Fax: (703) 818-4602

-----Original Message-----

From: Michael Adly@epamail.epa.gov
Sent: Wednesday, May 04, 2005 9:41 AM
To: Benhoff, Michael
Cc: feranda.jennifer@epamail.epa.gov
Subject: Re: Region 02 | Case 34156 | Lab CEIMIC | Issue Multiple

Mike,

Sorry for overlooking this one. Please advise the lab to proceed as per the scheduling notification, and note the issue in the SDG narrative.

Thanks.

Adly A. Michael
 Region 2 - HWSB - HWSS
 Phone: (732) 906-6161
 (732) 321-6622

-----Original Message-----

From: Benhoff, Michael
Sent: Wednesday, May 04, 2005 9:19 AM
To: Adly Michael (E-mail); Jennifer Feranda (E-mail)
Subject: Region 02 | Case 34156 | Lab CEIMIC | Issue Multiple

0297

Adly:

Have you received any information in issue 2 below? The lab is waiting for this resolution.

Thanks,
Mike

-----Original Message-----

From: Benhoff, Michael

Sent: Monday, May 02, 2005 11:11 AM

To: Adly Michael (E-mail); Jennifer Feranda (E-mail)

Subject: Region 02 | Case 34156 | Lab CEIMIC | Issue Multiple

Hi Adly:

Please advise on issue 2 below. Issue 1 was brought up in a separate email.

Issue 1: The lab received 20 samples for this Case, but was scheduled for 37 samples. The lab would like to know if the Case is complete.

Issue 2: The TR only indicates samples for TM analysis, but the lab was scheduled for TM/Hg/CN analysis.

Thanks,
Mike

Michael Benhoff

Computer Sciences Corporation

ITP Coordinator for Regions 1, 2, and 3

michael.benhoff@dyncorp.com

Phone: (703) 818-4357; Fax: (703) 818-4602

This is a **PRIVATE** message. If you are not the intended recipient, please delete without copying and kindly advise us by e-mail of the mistake in delivery. **NOTE:** Regardless of content, this e-mail shall not operate to bind CSC to any order or other contract unless pursuant to explicit written agreement or government initiative expressly permitting the use of e-mail for such purpose.

5/2/2005 9:07 AM Ryan Montalbano, CEIMIC, contacted Mike Benhoff, SMO with issues for Case 34156. Ryan indicated that the lab received 20 samples for this Case, but they were scheduled for 37 samples. Also, the TR only indicates TM analysis, but the lab was scheduled for TM/Hg/CN analysis.

SDG# MB12T.

SOP No. HW-2

Evaluation of Metals Data for the Contract Laboratory Program (CLP)

based on

SOW - ILM05.2

(SOP Revision 12)

DRAFT

PREPARED BY:

Hanif Sheikh
Hanif Sheikh, Quality Assurance Chemist
Hazardous Waste Support Section

DATE: 3-12-03

APPROVED BY:

Robert A. Runyon
Robert Runyon, Chief
Hazardous Waste Support Branch

DATE: 3/12/03

Standard Operating Procedure
USEPA Region 2
Evaluation of Metals Data for the Contract Laboratory Program
Data Assessment and Contract Compliance Review

SOP: HW-2 Revision 12

Mar. 2003

1.0 Scope

- 1.1 This Standard Operating Procedure (SOP) is applicable to evaluate the Routine Analytical Services (RAS) inorganic data generated in accordance with the EPA Contract Laboratory Program (CLP) protocols.
- 1.2 This SOP is used to validate the data generated from water and soil/sediment samples collected from Superfund sites in EPA Region 2.
- 1.3 Data should be generated and validated in accordance with the site specific Data Quality Objectives (DQOs) specified in the Agency-approved Quality Assurance Project Plan (QAPP). The DQOs must be developed prior to the sample collection event. If the site specific DQOs are not available, this SOP must be used in its entirety.
- 1.4 The Region 2 inorganic data validation SOP is based, for the most part, upon analytical and quality assurance requirements specified in the Statement of Work (SOW) ILM05.2, as well as the current USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. The SOP Checklist, Appendix A.1, is to conduct data validation. The result of the use of this SOP is a Total Review of the data: Technical plus Contract - Compliance Review.

2.0 Contract Compliance Review

This type of review is the first step in data validation which is carried out to ensure that the CLP laboratory analyzed the environmental samples in accordance with the Statement of Work (SOW), and provided the data package which is both complete and compliant. This means that different laboratory procedures were performed exactly as specified in the CLP Statement of Works (SOW) and the data package contains all the deliverables with all the information required under the contract.

2.1 Completeness

Completeness ensures that a sufficient amount of data and information relative to the prescribed DQOs are present. The data validator must check the entire data package to ensure that all deliverables required under the CLP contract are present and legible. In addition, Contract Compliance Screening (CCS) report, resubmittal from the laboratory and Regional documentation should also be present in the data package. In Region 2, the data package completeness check is also performed by Regional Sample Control Coordinator (RSCC) for each Sample Delivery Group (SDG) by verifying the presence of all deliverables in the data package submitted by the

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laboratory. This CSF (Complete SDG File) audit is performed prior to the start of the data validation.

2.2 Compliance

The data validator must check to ensure that all steps from sample receipt through sample preparation, analysis, data calculation and reporting were performed according to the SOW/QAPP, and the required data/information was present in the reporting Forms and laboratory logs.

2.3 Contract Compliance Screening (CCS)

This screening step essentially checks the data package for the Completeness and Compliance requirements, and is currently performed by Sample Management Office (SMO) operated by DynCorp, an EPA contractor. The CCS Report is intended to aid the data validator in locating any problems, both corrected and uncorrected. The original deliverable in the data package must be replaced by the resubmittal received from the laboratory in response to the CCS Report. The Report for each SDG is transmitted electronically by the CLASS to the Regional office. The data validation should, however, be carried out even if the CCS Report is not available.

3.0 Technical Review

Technical review of the RAS data is carried out on the complete and compliant data to ensure its validity (i.e., data is of known quality and scientifically valid) and usability (i.e., ~~data set is sufficiently complete and of sufficient~~ quality to support a decision or an action described in the specific objectives of a data collection activity. The technical review process provides information on analytical limitations of data, if there are any, based on specific Quality Assurance/Quality Control (QA/QC) criteria. This is accomplished by performing an in-depth review of both the field deliverables which document the field sampling activities, and the laboratory analytical data deliverables which document the laboratory activities carried out to generate the reported data. Essentially, the validator shall first ensure that the data package is complete and compliant. The validator shall then evaluate data/information on all these deliverables (Final data sheets, QC analyses Forms, Chain-of-Custody/Traffic Report Forms, Raw data instrument printouts, etc.) against the QA/QC acceptance criteria specified in the SOP "Checklist" (Appendix A.1). The validator must answer each question in the "Checklist" and, if required, take an appropriate action as required under "Action". As a result of the technical review, validator may flag some of the data as rejected or as estimated. The

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validator shall write a Data Review Narrative documenting the qualified data and the reason(s) for the qualification.

3.1 If the raw data necessary to support the reported results are not provided, the data validation must not be performed.

3.2 If batch quality control analyses are performed on samples other than site specific samples, data must be considered as estimated.

3.3 QA/QC Acceptance Criteria -

In order that reviews be consistent among reviewers, QA/QC protocol (stated in Appendix A.1) should be strictly adhered to. If a lab provides more than one set of QC analyses or more than one particular QC analysis for an SDG, the validator shall use the worst QC analysis to evaluate the SDG data. Professional judgement should only be used in the rare instances not addressed in the "Checklist".

3.4 Data Validation Flags

Only two types of validation flags, J & R, are used in Region 2 to qualify the data.

3.4.1 Flag "R" indicates Rejected Data

Sample results determined to be unacceptable must preferably be lined over or flagged " R" with a red pencil only on the Inorganic Analysis Data Sheets (CLP Form I's). Data rejected on the basis of an unacceptable QC analysis should be excluded from any further review or consideration. Data are rejected when associated QC analysis results exceed the expanded limits of the QC criteria. The rejected data are known to contain significant errors based on documented information. The data user must not use the rejected data to make environmental decisions.

3.4.2 Flag "J" indicates Estimated Data

Sample results determined to be estimated must be flagged with " J" with a red pencil only on the Inorganic Data Sheets (CLP Form I's). Data are flagged (J) when a QC analysis falls outside the primary acceptance limits. The flagged "J" data are not excluded from further review or consideration. Only one flag (J) is applied to a sample result even though several associated QC analyses may fail. The "J" data may be biased high or low.

4.0 Rounding Rule

The data reviewer must follow the standard practice to round off percent recoveries on the QC reporting forms.

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5.0 Data Review Narrative (Appendix A.2)

The data review narrative should be written using the format of Appendix A.2. The narrative should indicate the QC analyses outside the acceptance limits and the actions taken to qualify the associated data. The narrative should be prepared from a word processor or a typewriter. If hand-written, under no circumstances should a pencil be used to write the narrative. The data review narrative should be written in three sections after a brief description of the data case: (i) Complete Sample Delivery Group File (CSF) Audit Section, (ii) Technical Review Section, and (iii) Contract-Problems/Non-Compliance Section.

5.1 CSF Audit Section

The data validator must perform an audit on each SDG in the data package and report in this Section any missing deliverables (analytical or sampling documents) or discrepancy with the deliverables. In Region 2, this audit is currently performed and its findings reported by the ESAT Regional Sample Control Coordinator (RSCC) under "Comments" on a CSF inventory checklist. The validator verifies the results of such an audit before reporting them in the narrative (Appendix A.2). The validator must obtain the missing deliverable or information before proceeding to validation.

5.2 Technical Review Section

The data validator shall report in this Section only the rejected and estimated data rendered as a result of technical review. It is imperative that the data reviewer highlights (i) QC analysis criteria applied to reject or flag (J) the data, (ii) Samples rejected or flagged (J), and (iii) the affected analyte(s). The rest of the data that are not qualified (rejected or estimated) are not reported in this Section, and should be considered fully useable.

5.3 Contract-Problems/Non-Compliance Section

All the CLP non-compliant items must be reported under this Section.

6.0 Computer-Aided Data Review and Evaluation (CADRE)

CADRE is a computer program that performs semi-automated Quality Assurance (QA) and Quality Control (QC) checks of results from the chemical analysis of soil and water samples according to the CLP protocols. The EPA Headquarters provides the Regions with the CADRE software which is utilized to evaluate the data on a computer diskette provided by the CLP laboratory. After the CADRE data qualification is complete, a Lotus 1,2,3 spreadsheet with validation qualifiers (R,J) is

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generated for each SDG. Currently, Sample Management Office (SMO) performs this task using Data Assessment Tool (DAT), a software-driven process and forwards to Regions the customized electronic spreadsheets and QC reports via the DART (Data Assessment Rapid Transmittal) system. The manual data validation is performed in conjunction with electronic data validation. That can only be done by a trained and experienced data validator. The manual data review complements CADRE's findings to complete an assessment of data quality in a shorter time than a solely manual process. The data validator must review the Lotus 1,2,3 spreadsheet against Form I's to ensure that the same results on Form I's and the Lotus Spreadsheet are qualified with the same validation qualifiers. The Lotus spreadsheet is attached with the data review narrative.

7.0 PES Based Data Validation Strategy

7.1 Scope and Summary

This strategy offers the use of Performance Evaluation Sample (PES) in conjunction with the Region 2 validation SOP (# HW-2) as a means of ensuring the quality of the CLP data while significantly reducing the validation time. The single blind PES provided by EPA (or any other reputable firm) is analyzed with samples of each matrix in a Sample Delivery Group (SDG). A software program (e.g., PEAC TOOLS, SPS Web or equivalent) is used to determine whether or not the PES results fall within the previously statistically determined acceptance limits, "Action Limits". The PES results falling within the Action Limits are considered as acceptable results and may be designated as "Passed" analytes, and results of the analytes falling outside the Action Limits are considered as unacceptable and may be designated as "Failed" analytes. In either case ("Passed" Analytes or "Failed" analytes), the associated data is validated according to the Region 2 data validation SOP # HW-2, using the following strategy (procedure):

7.2 "Passed" COC

If the Contaminants of Concern (COC) in an SDG are within the Action Limits, the data validation is conducted according to the data validation SOP QC Criteria indicated in the "Review COC For" column of "Table P". The SDG samples are qualified and the validation flags (J & R) applied as usual on Form I's as well on the Lotus 1,2,3 Spreadsheets. Corrections, if needed, are then made on the Lotus spreadsheets to ensure that all

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results on Form I's carry the same data validation flags as on the Lotus Spreadsheets.

7.3 "Failed" COC

If the Contaminants of Concern (COC) in an SDG are not within the Action Limits, the data validation is conducted according to the data validation SOP QC Criteria indicated in the "Review COC For" column of "Table F". The SDG samples are qualified and the validation flags (J & R) applied as usual on Form I's as well on the Lotus 1,2,3 Spreadsheets. Corrections, if needed, are then made on the Lotus spreadsheets to ensure that all results on Form I's carry the same data validation flags as on the Lotus Spreadsheets.

Table P

Passed PES - All Contaminants of Concern are within the limits
(Action Low \leq PES Result \leq Action High)

Criteria	QC	Review COC for
Holding Time & preservation		**
Initial Calibration		
Initial Calibration Verification		
CRQL Standard Standard		**
Blanks-Initial & Continuing		
Preparation Blank		
ICP Interference Check Sample		
Pre- Digestion/Distillation Matrix Spike		

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Post Digestion Spike	
Laboratory Duplicate	
Field Duplicates Comparison	**
Lab Control Sample	
ICP Serial Dilution	
Field Blank Contamination	**
Percent Solids	
Transcription/Computation Check	
Raw Data	
Total vs. Dissolved Concentrations Comparison	**

- The CSF (Complete SDG File) audit will be completed before the PES validation strategy is applied.
- Comparison of the CADRE Spreadsheet must be after the PES validation strategy is applied.
- The Contract Compliance can be checked after the PES validation strategy is applied.

Table F

Failed PES - Contaminants of Concern are not within the limits
(PES Result \leq Action Low, PES Result \geq Action High OR The Limits Not Established)

QC Criteria	Review COC for
-------------	----------------------

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Holding Time & preservation	**
Initial Calibration	
Initial Calibration Verification	
CRQL Standard Standard	**
Blanks-Initial & Continuing	
Preparation Blank	**
ICP Interference Check Sample	
Pre- Digestion/Distillation Matrix Spike	**
Post Digestion Spike	
Laboratory Duplicate	**
Field Duplicates Comparison	**
Lab Control Sample	**
ICP Serial Dilution	**
Field Blank Contamination	**
Percent Solids	**
Transcription/Computation Check	**
Raw Data	
Total vs. Dissolved Concentrations Comparison	**

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- The CSF (Complete SDG File) audit will be completed before the PES validation strategy is applied.
- Comparison of the CADRE Spreadsheet must be after the PES validation strategy is applied.
- The Contract Compliance can be checked after the PES validation strategy is applied.

8.0 Sampling Trip Report

The sampler prepares a Sampling Trip Report for each sampling event and sends it to the RSCC. The report provides details of all activities performed for each sampling event on the Superfund site. It also lists the field QC samples such as field duplicates, field/rinse blanks, sampling time and date for each sample, and samples associated with each field/rinse blank. The validator must use the information in the report to evaluate the correct field duplicate pairs as well as samples associated with contaminated field/rinse blanks.

9.0 Telephone Record Log

A Telephone Record Log (Appendix A.3) must be written by the data validator when a deliverable is missing or a clarification is needed about a lab procedure. The data validator should outline a basic profile of the Case on the Telephone Record Log Form, clearly indicating the reason(s) for inquiry and forward this Form to CLP PO/TOPO who will contact the lab to receive the missing document or information. The original Telephone Record Log is kept in the data package and a copy attached to the data review narrative.

10.0 Request for Re-analysis

Data validator must note all items of contract non-compliance in the data review narrative. If holding times and sample storage times have not been exceeded, the Project Officer (PO) may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record" form (Appendix A.4).

11.0 CLP Data Assessment Summary Form (Appendix A.5)

Fill in the total number of analytes performed by different methods and the number of analytes rejected or flagged (J) as estimated due to corresponding quality control criteria. Place an "X" in boxes wherever analyses were not performed, or criteria do not apply.

12.0 Data Review Log:

It is recommended that the data validator maintain a log of the reviews completed to document:

- a. Case number
- b. SDG # (s)
- c. number of samples
- d. matrix of samples
- e. contract laboratory
- f. site name
- g. start-date of the data case review
- h. completion-date of the data case review
- i. actual hours spent
- j. reviewer's signature

13.0 Record of Communication

This is a Regional document prepared and provided by the RSCC for each data package. The ROC indicates the Case #, site name, samples and sample matrix and the laboratory name. The presence of an ROC in a data package is an indication that the package has been reviewed by the RSCC for completeness and is ready for data validation.

14.0 Forwarded Paperwork

Upon completion of review, the following are to be forwarded to EPA for final review:

- a. Data package
- b. Original and a copy of completed data review narrative.
- c. Completed data assessment checklist (Appendix A.1, original)
- d. CLASS Contract Compliance Screening (CCS) report
- e. Telephone Record Log
- f. CLP Re-analysis Request/Approval Record Form (Appendix A.4)
- g. Data Assessment Summary Form (Appendix A.5)
- h. CADRE Spreadsheet on a computer diskette.

Case #:

SDG #:

Samples: Soil Water

Site:

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		YES	NO	N/
A.1.1	<u>Contract Compliance Screening Report (CCS)</u>			
	Present?	<input checked="" type="checkbox"/>		
	<u>ACTION:</u> If no, contact RSCC/PO.			
A.1.2	<u>Record of Communication (from RSCC)</u>			
	Present?	<input checked="" type="checkbox"/>		
	<u>ACTION:</u> If no, request from RSCC.			
A.1.3	<u>Sampling Trip Report</u>			
	Present and complete?	<input checked="" type="checkbox"/>		
	<u>ACTION:</u> If no, contact RSCC/PO.			
A.1.4	<u>Chain of Custody/Sample Traffic Report</u>			
	Present?	<input checked="" type="checkbox"/>		
	Legible?	<input checked="" type="checkbox"/>		
	Signature of sample custodian present?	<input checked="" type="checkbox"/>		
	<u>ACTION:</u> If no, contact RSCC/WAM/PO.			
A.1.5	<u>Cover Page</u>			
	Present?	<input checked="" type="checkbox"/>		
	Is the Cover Page properly filled in and the verbatim signed by the lab manager or the manager's designee?	<input checked="" type="checkbox"/>		
	<u>ACTION:</u> If no, prepare Telephone Record Log, and contact PO for resubmittal of the Cover Page.			
	Do number of samples correspond to numbers on the Regional Record of Communication (ROC) for the data Case?	<input checked="" type="checkbox"/>		
	Do the sample numbers on the Cover Page agree with sample numbers on:			
	(a) Traffic Report Sheet?	<input checked="" type="checkbox"/>		

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	YES	NO	N/A
(b) Form I's?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ACTION:

If no for any of the above, prepare Telephone Record Log and contact PO for resubmittal from the laboratory.

A.1.6 SDG Narrative, DC-2 Form

Is the SDG Narrative present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-------------------------------	-------------------------------------	--------------------------	--------------------------

Is Form DC-2 present and complete?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
------------------------------------	-------------------------------------	--------------------------	--------------------------

Action:

If no, write in the Contract-Problems/Non-Compliance Section of the data review narrative.

A.1.7 Form I to XV

A.1.7.1 Are all the Form I through Form XV labeled with:

Laboratory Name?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
------------------	-------------------------------------	--------------------------	--------------------------

Laboratory Code?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
------------------	-------------------------------------	--------------------------	--------------------------

RAS/Non-RAS Case No.?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-----------------------	-------------------------------------	--------------------------	--------------------------

SDG No.?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
----------	-------------------------------------	--------------------------	--------------------------

Contract No.?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
---------------	-------------------------------------	--------------------------	--------------------------

ACTION:

If no for any of the above, note under Contract Problem/Non-Compliance Section of the "Data Review Narrative" and contact PO for corrected Form(s) from the laboratory.

A.1.7. After comparing values on Forms I-IX against the raw data, do any computation/transcription errors exceed 10% of the reported values on the Forms for:

(NOTE: Check all Forms against raw data.)

(a) all analytes analyzed by ICP-AES?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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(b) all analytes analyzed by ICP-MS?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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	YES	NO	N/
(c) Mercury?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
(d) Cyanide?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ACTION:

If yes, prepare Telephone Record Log and contact PO/TOPO for the corrected data from the laboratory. Correct errors with red pencil and initial.

A.1.8 Raw Data *N/A AS PER TDF.*

Data shall not be validated without the hard/electronic copies of the associated raw data for samples and QC samples.

A.1.8.1	Digestion Log for ICP-AES (Form XII) present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Digestion Log for ICP-MS Form XII present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Digestion Log for mercury Form XII present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Distillation Log for cyanide Form XII present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Are pH values (pH<2 for all metals, pH>12 for cyanide) reported for each aqueous sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Note:

Digestion/Distillation log must include weights, dilutions and volumes used to obtain the reported results.

Percent solids calculation present for soils/sediments?

☐ ☐ ☒

Are preparation dates present on sample preparation logs/bench sheets?

☐ ☐ ☒

A.1.8.2 Instrument measurement read-out record present for:

ICP-AES?

☐ ☐ ☒

ICP-MS?

☐ ☐ ☒

Mercury?

☐ ☐ ☒

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YES NO N/A

Attach this list to the checklist.

A.1.9.2 Is pH of aqueous samples for:

Metals Analysis <2? ☐ ☐ ☒Cyanide Analysis >12? ☐ ☐ ☒Temperature of sample/cooler 4 ± 2 C°? ☒ ☐ ☐Action:

If no, reject (red-line) non-detects
and flag (J) as estimated positive values.

A.1.10 Final Data Correctness - Form I *N/A AS PER TDF.*A.1.10.1 Are Form I's for all samples present and complete? ☐ ☐ ☐ACTION:

If no, prepare telephone record log
and contact PO/TOPO for submittal from
the laboratory.

A.1.10.2 Verify there are no calculation and
transcription errors in the results
reported on Form I's. Circle on each
Form I all results that are incorrect.

Is the calculation error less than 10%
of the correct result? ☐ ☐ ☒Are results on Form I's reported in
correct units (ug/L for waters and
mg/kg for soils)? ☐ ☐ ☒Are results on Form I'S reported by
correct significant figures? ☐ ☐ ☒Are soil sample results for each
parameter corrected for percent solids? ☐ ☐ ☒Are all "less than MDL" values reported
by the CRQLs and coded with "U" ? ☐ ☐ ☒

Are values less than the CRQLs but greater

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	YES	NO	N
than or equal to the MDLs flagged with "J"?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are appropriate contractual quality control and Method qualifiers use?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ACTION:

If no for any of the above, prepare Telephone Record Log, and contact PO/TOPO for corrected data.

A.1.10.3 Do EPA sample numbers and the corresponding laboratory sample identification numbers match on the Cover Page, Form I's and in the raw data?

☐ ☐ ☒

Was a brief physical description of the samples before and after digestion given on the Form I's?

☐ ☐ ☒

Was a sample out of the calibration range for mercury and cyanide or the linear range for ICP-AES/ICP-MS diluted and noted on the Form I?

☐ ☐ ☒

ACTION:

If no for any of the above, note under the Contract-Problem/Non-Compliance Section of the data review narrative.

A.1.11 Initial Calibration *N/A AS PER TDF.*

A.1.11.1 Is a record of at least a 2 point calibration present for ICP-AES analysis?

☐ ☐ ☒

Is a record of 2 point calibration present for ICP-MS analysis?

☐ ☐ ☒

Is a record of a 5 point calibration present for Hg analysis?

☐ ☐ ☒

Is a record of a 4 point calibration present for cyanide?

☐ ☐ ☒

ACTION:

If no, reject the associated data if no ICV, CCV CRQL standard and LCS with acceptable recoveries were analyzed before the samples.

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	<u>YES</u>	<u>NO</u>	<u>N/A</u>
Is one calibration standard at the CRQL level for cyanide and mercury?	[]	—	✓

ACTION:

If no, write in the Contract Problem/Non-Compliance Section of the data review narrative.

A.1.11.2 Is the curve correlation coefficient ≥ 0.995 for:

Mercury Analysis?	[]	—	✓
Cyanide Analysis?	[]	—	✓

ACTION:

If no, flag (J) the associated data as estimated.

NOTE:

The correlation coefficient shall be calculated by the data validator using standard concentrations and the corresponding instrument response (e.g. absorbance, peak area, peak height, etc.).

A.1.12 Initial and Continuing Calibration Verification - (Form II A)A.1.12.1 Present and complete for every metal and cyanide? *N/A AS PER TDF.* [] — ✓

Present and complete for ICP-AES and ICP-MS when both these methods are used for the same analyte? [] — ✓

ACTION:

If no for any of the above, prepare a Telephone Record Log and contact PO/TOPO for resubmittal from the laboratory.

A.1.12.2 Circle on each Form IIA all percent recoveries that are outside the contract windows.

Are ICV/CCVs within control limits for:

Metals - 90-110%R?	[]	—	✓
Hg - 80-120%R?	[]	—	✓
Cyanide - 85-115%R?	[]	—	✓

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YES NO N/

ACTION:

If no, qualify five samples on either side of the verification standard with an unacceptable recovery as follows:

Flag(J) as estimated all positive data (not flagged with "U") analyzed between a calibration verification standard with percent recovery between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) and the nearest calibration standard with an acceptable percent recovery.

Qualify associated results less than the MDL as "UJ" if the ICV/CCV %R is between 75-89% (65-75% for Hg; 70-84% for CN).

Reject (red-line) only positive data if the recovery is greater than 125%.

Reject all associated results if the recovery is less than 75%.

Note:

Include all QC samples in the five sample count but qualify only sample results on Form I's.

A.1.12.3 Was a Continuing Calibration Verification performed every 10 samples or every 2 hours whichever is more frequent?

[]

✓

Was the ICV and/or mid-range standard for cyanide distilled?

[]

✓

ACTION:

If no for any of the above, write in the Contract-Problem/Non-Compliance Section of the data review narrative.

* If the mid-range standard was not analyzed, compute the concentration of the missing mid-range standard from the calibration range in order to calculate the affected range for cyanide.

A.1.13 CRQL Standard Analysis - (Form II B)

A.1.13.1 For each ICP-AES run, was a CRI (CRQL or MDL when MDL > CRQL) standard analyzed?

[✓]

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YES NO N/A

(Note: CRI for AL, Ba, Ca, Fe, Mg, Na and K is not required.)

For each ICP-MS run, was a CRI (CRQL or MDL when MDL > CRQL) standard analyzed for each mass/isotope used in the analysis of all ICP-MS analytes?

☒

For each mercury run, was a CRQL standard analyzed?

☒

For each cyanide run, was a CRQL standard analyzed?

☒**ACTION:**

If no for any of the above, write this deficiency in the Contract Problems/Non-Compliance Section of the Data Assessment Narrative, inform the CLP PO and flag (J) as estimated all the associated data falling within the affected ranges.

The affected ranges are:

ICP-AES Analysis - *True Value \pm CRQL
ICP-MS Analysis - *True Value \pm CRQL
Mercury Analysis - *True Value \pm CRQL
Cyanide Analysis - *True Value \pm CRQL

* True value of the CRQL Standard

A.1.13.2 Was a CRQL analyzed after the ICV/ICB, before the final CCV/CCB and once every 20 analytical samples in analytical run for each analysis?

☒**ACTION:**

If no, write in Contract Problem/Non-Compliance Section of the "Data Review Narrative".

A.1.13.3 Circle on each Form IIB all percent recoveries that are outside the acceptance windows.

Is the CRQL standard within control limits for:

For ICP-AES & ICP-MS:

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	<u>YES</u>	<u>NO</u>	<u>N/A</u>
Metals - 70 - 130%?	[]	<input checked="" type="checkbox"/>	___
Mercury - 70 - 130%?	[<input checked="" type="checkbox"/>]	___	___
Cyanide - 70 - 130%?	[<input checked="" type="checkbox"/>]	___	___

ACTION:

If no, flag (J) as estimated all sample results within the affected range if the CRQL standard recovery is between 50 - 69%;

flag (J) only positive data within the affected range if the recovery is > 130% but < 180%; reject all data within the affected range if the recovery is less than 50%; reject only positive data within the affected range if the recovery is greater than 180%.

Note:

1. Qualify 50% of the samples on either side of the CRQL standard with % recovery outside the control limits.
2. QC samples are also included in the 50% sample count.
3. Flag (J) or reject (R) only the final sample results on Form I's when Sample raw data are within the affected ranges and the CRQL standard is outside the acceptance windows.
4. The samples and the CRQL standard must be analyzed in the same analytical run.

A.1.14. Initial and Continuing Calibration Blanks - Form III

N/A AS PER TDF.

A.1.14.1 Present and complete? [] ___

For all the instruments used for the metals and cyanide analyses? [] ___

Was an initial Calibration Blank analyzed after ICV? [] ___

Was a continuing Calibration Blank analyzed after every CCV and every 10 samples or every 2 hours, whichever is more frequent? [] ___

ACTION:

If no, inform PO/TOPO and write in the Contract-Problems/Non-Compliance section of the "Data Review Narrative".

A.1.14.2 Circle on each Form III all Calibration Blank values that are above the CRQL (or 2 x MDL when MDL > CRQL).

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When MDL < CRQL, are all Calibration Blanks less than or equal to the CRQLs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
When MDL > CRQL, are all Calibration Blanks less than two times MDL?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ACTION:

If no for any of the above, qualify positive results of five samples on either side of the elevated Calibration Blank when sample raw values are less than or equal the Calibration Blank greater than CRQL (when MDL < CRQL), or greater than 2 x MDL (when MDL > CRQL).

(QC samples are included in the five sample count)

A.1.15 FORM III (Preparation Blank) - *N/A AS PER TDF*
Note: The Preparation Blank for mercury is the same as the calibration blank.

A.1.15.1 Was one Preparation Blank prepared and analyzed for:

each Sample Delivery Group (SDG)?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
each batch of digested/distilled samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
each matrix type?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
All instruments used for metals and cyanide analyses?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Was a Preparation Blank digested/distilled with the SDG samples and analyzed with the associated samples in the same analytical run?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ACTION:

If no for any of the above, flag as estimated (J) all the associated positive data <10 x MDL for which the Preparation Blank was not analyzed.

NOTE:

If only one blank was analyzed for more than 20 samples, then the first 20 samples analyzed are not estimated (J), but all additional samples must be qualified (J).

YES NO N/A

A.1.15.2 When the MDL is less than or equal to the CRQL, is the preparation blank concentration greater than the CRQL?

If yes, is the sample concentration with the least concentrated analyte less than 10 times the Preparation Blank?

Note:

Convert soil sample results to mg/Kg on wet weight basis to compare with the soil Prep. Blank results on Form III.

ACTION:

If yes, reject (red-line) all associated data greater than the CRQL concentration but less than ten times the preparation blank value.

A.1.15.3 When the MDL is greater than the CRQL, is the preparation blank concentration on Form III greater than two times the MDL?

ACTION:

If yes, reject (red-line) all positive sample results with sample raw data less than 10 times the preparation blank value.

A.1.15.4 Is the Preparation Blank concentration below the negative CRQL?

ACTION:

If yes, reject (red-line) all associated sample results less than 10 x CRQL.

A.1.16 ICP-AES/ICP-MS Interference Check Sample - (Form IV)

NOTE:

Not required for mercury, CN, Al, Ca, Fe and Mg.

A.1.16.1 Present and complete?

Was ICS analyzed at the beginning and end of each run, or once for 20 or fewer analytical samples?

ACTION:

If no, flag as estimated (J) all sample results.

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YES NO N/A

A.1.16.2 Circle all values on each Form IV that are more than $\pm 20\%$ of true or established mean value of any element in the ICS AB solution.

Are all the Interference Check Sample results within the control limits ($\pm 20\%$) for analytes with MDLs \leq CRQL?

[] ✓ —

If no, is the sample concentration of Al, Ca, Fe, or Mg less than 50% of the respective concentration in ICS AB Solution?

[] ✓ —

ACTION:

If no, flag (J) as estimated those positive results for which the ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject only positive results results (not flagged with "U").

A.1.16.3 Do the ICP-AES results for analytes with CRQLs ≤ 10 ug/L fall within $\pm 2 \times \text{CRQL}$ ($\pm 3 \times \text{CRQL}$ for ICP-MS) of the analyte's true value in the ICS A solution?

[✓] — —

If no, was the affected analyte(s) analyzed by an alternate method?

[] — ✓

Action:

If no, flag (J) as estimated the affected analyte data.

A.1.16.4 Circle on Form IV all values $\geq 5 \times \text{MDL}$ HS 11/8/04 that should not be present in the ICS A solution.

Is the sample concentration of Al, Fe, Ca, or Mg greater than or equal to 50% of the respective concentrations in the ICS A solution?

✓ [] —

Action:

If yes, flag as estimated (J) the affected sample result if the estimated interference due to interfering element(s) in sample is 10-50% of the analyte concentration "found" in the sample.

YES NO N/A

Reject the affected sample result if the estimated interference is 50% of the sample concentration or greater.

A.1.17 Spiked Sample Recovery: Pre-Digestion/Pre-Distillation) (Form V A
Note:

Not required for Ca, Mg, K, and Na (both matrices); Al and Fe (soil only.)

A.1.17.1 Was Matrix Spike analysis performed:

on a site specific sample?

[☒]

for each SDG?

[☒]

for each matrix type?

[☒]

for each concentration range
(i.e., low, med., high)?

[☒]

for each Method (ICP-AES, ICP-MS, Hg, CN) used?

[☒]

Was a spiked sample prepared and analyzed with
the SDG samples?

[☒]

ACTION:

If no for any of the above, flag as estimated (J) all the positive data less than four times the SOW specified spiking levels for which a spiked sample was not analyzed.

NOTE:

If more than one spiked sample were analyzed for one SDG then qualify the associated data based on the worst spiked sample analysis.

A.1.17.2 Was a field blank or PE sample used for the
spiked sample analysis?

[☐]

[☒]

ACTION:

If yes, flag as estimated (J) all positive data less than 4 x spike added for which the field blank was used for the spiked sample analysis.

A.1.17.3 Circle on each Form VA all spike recoveries that are outside the control limits (75% to 125%) that have sample concentrations less than four times the added spike concentrations.

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YES NO N/A

Are all recoveries within the control limits when sample concentrations are less than or equal to four times the spike concentrations? ☐ ☒ ☐

Note:

Disregard the out of control spike recoveries for analytes whose concentrations are greater than or equal to four times the spike added.

Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA? ☒ ☐ ☐

ACTION:

If no, write in the Contract - Problem/Non - Compliance Section of the Data Review Narrative.

A.1.17.4 Aqueous

Are any spike recoveries:

- | | | | |
|------------------------|-----|-----|---|
| (a) less than 30%? | ___ | [] | ✓ |
| (b) between 30-74%? | ___ | [] | ✓ |
| (c) between 126-150%? | ___ | [] | ✓ |
| (d) greater than 150%? | ___ | [] | ✓ |

ACTION:

If the matrix spike recovery is less than 30%, reject all associated aqueous data; if between 30-74%, flag (J) all associated aqueous data as estimated; if between 126-150%, flag (J) as estimated all data not flagged with "U"; if greater than 150%, reject (red-line) all associated data not flagged with "U".

A.1.17.5 Soil/Sediment

Are any spike recoveries:

- | | | | |
|-----------------------|---|-----|-----|
| (a) less than 10%? | ✓ | [] | ___ |
| (b) between 10-74%? | ✓ | [] | ___ |
| (c) between 126-200%? | ✓ | [] | ___ |

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(d) greater than 200%?

YESNON/A[☒]ACTION:

If yes for any of the above, proceed as follows:
 If the matrix spike recovery is less than 10%,
 reject all associated data; if between 10-74%,
 flag(J) all associated data as estimated; if
 between 126-200%, flag (J) as estimated all
 associated data not flagged with "U"; If greater
 than 200%, reject all associated data not
 flagged with "U".

A.1.18 Lab Duplicates) - Form VI

A.1.18.1 Was the lab duplicate analysis performed:

on a site specific sample?

[☒]

for each SDG?

[☒]

for each matrix type?

[☒]for each concentration range (i.e. low, med.,
high)?[☒]

for each Method(ICP-AES, ICP-MS, Hg, CN) used?

[☒]Was a lab duplicate prepared and analyzed with
the SDG samples?[☒]ACTION:

If no for any of the above, flag as estimated
 (J) all the data \geq CRQL* for which the duplicate
 analysis was not performed.

Note:

1. If more than one duplicate sample was analyzed for an SDG, then qualify the associated samples based on the worst lab duplicate analysis.
2. If the percent solids difference between soil sample and its duplicate is $> 5\%$, then prepare a Form VI (Appendix #) for the lab duplicate analysis. Convert sample and its duplicate results (mg/kg) on Form I's into ug/L on wet weight basis and report on Appendix . Calculate RPD or absolute difference wherever applicable and evaluate the Lab Duplicate analysis in accordance with QC Criteria stated in A.1.18.5 .

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YES NO N/A

A.1.18.2 Was a field blank or PE sample used for the lab Duplicate analysis?

[☒]

ACTION:

If yes, flag as estimated (J) all data \geq CRQL (or all data $>$ MDL when MDL $>$ CRQL) for which field blank was used as duplicate.

A.1.18.3 Circle on each Form VI all values that are:

RPD $>$ 20%, or
Difference $>$ CRQL*

Are all values within control limits (\leq RPD 20% or difference $\leq \pm$ CRQL)?

[]

☒

If no, are all results outside the control Limits flagged with an * on Form I's and VI?

[☒]

ACTION:

If no, write in the Contract-Problems/Non-Compliance Section of the Data Review Narrative.

NOTE:

RPD is not to be calculated for any analyte of the sample-duplicate pair when both values are less than the MDL.

A.1.18.4 Aqueous

When sample and duplicate values are both greater than or equal to 5 times the CRQL (substitute MDL for CRQL when MDL $>$ CRQL),

is any RPD \geq 20% but $<$ 100%?

[]

☒

is any RPD \geq 100%?

[]

☒

ACTION:

If the RPD is \geq 20% but $<$ 100%, flag (J) as estimated the associated sample data \geq CRQL.
If the RPD is equal to or greater than 100%, reject the associated sample data \geq CRQL.

A.18.5 When the sample or duplicate value(s) is less than 5 times CRQL (substitute MDL for CRQL when MDL $>$ CRQL), is the absolute difference between sample and duplicate values $>$ CRQL?

[]

☒

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	<u>YES</u>	<u>NO</u>	<u>N/A</u>
is the absolute difference $\geq 2 \times \text{CRQL}$?	<u> </u>	<u>[]</u>	<u> </u>

ACTION:

If the difference is greater than the CRQL, flag (J) as estimated the associated sample data $\geq \text{CRQL}$. If the difference is greater than $2 \times \text{CRQL}$, reject the associated sample data $\geq \text{CRQL}$.

A.1.18.5 Soil/Sediment

When sample and duplicate values are both greater than or equal to 5 times CRQL (substitute MDL for CRQL when MDL > CRQL),

is any RPD $\geq 35\%$ but $< 120\%$? []

is any RPD $\geq 120\%$? []

ACTION:

If the RPD is $\geq 35\%$ and $< 120\%$, flag (J) as estimated the associated sample data $\geq \text{CRQL}$. If the RPD is equal to or greater than 120% , reject the associated sample data $\geq \text{CRQL}$.

A.1.18.6 When the sample and/or duplicate value(s) are less than 5 times CRQL (substitute MDL for CRQL when MDL > CRQL), is the absolute difference between sample and duplicate:

$> 2 \times \text{CRQL}$? []

$> 4 \times \text{CRQL}$? []

ACTION:

If the absolute difference is greater than $2 \times \text{CRQL}$, flag (J) as estimated the associated sample data $\geq \text{CRQL}$. If the absolute difference is greater than $4 \times \text{CRQL}$, reject the associated sample data $\geq \text{CRQL}$.

Note: Use absolute values of sample and duplicate to calculate the difference.

A.1.19 Field Duplicates

A.1.19.1 Was an aqueous field duplicate pair analyzed? []
(Check the Sampling Trip Report)

ACTION:

If yes, prepare a Form VI (Appendix -) for

<u>YES</u>	<u>NO</u>	<u>N/A</u>
------------	-----------	------------

each aqueous field duplicate pair. Report sample and duplicate sample results on Appendix - from their respective Form I's.

A.1.19.2 Was a soil field duplicate pair analyzed?
(Check the Sampling Trip Report)

[☒]

ACTION:

If yes, for each soil field duplicate pair proceed as follows:

(a) If the percent solids difference between soil sample and its duplicate is > 5%, then prepare a Form VI (Appendix #) for the lab duplicate analysis. Convert sample and its duplicate results (mg/kg) on Form I's into ug/L on wet weight basis and report on Appendix . Calculate the RPD or absolute difference where applicable and evaluate the Lab Duplicate analysis in accordance with QC Criteria stated in A.1.18.5.

(b) If the percent solids difference is less than 5%, then the results for sample and its duplicate are reported on Appendix - as mg/kg on dry weight basis.

NOTE:

1. Do not calculate RPD when both values are less than MDL.
2. Substitute MDL for CRQL when MDL > CRQL.
3. Use absolute values of sample and duplicate to calculate the difference.

A.1.19.3 Aqueous

Circle all values on the validator-prepared Form VI (Appendix-) for field duplicates that have:

RPD \geq 50%?

___ [☐]

☒

Difference > CRQL?

___ [☐]

☒

When sample and duplicate values are both greater than or equal to 5 times CRQL (substitute MDL for CRQL when MDL > CRQL),

is any RPD \geq 50%?

___ [☐]

☒

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	YES	NO	N/A
is any RPD \geq 100%?	___	[]	___

Action:

If the RPD is $\geq 50\%$ but $< 100\%$, flag (J) as estimated the associated sample data \geq CRQL.

If the RPD is equal to or greater than 100%, reject the associated sample data \geq CRQL.

When the sample and/or duplicate value(s) are less than 5 times CRQL (substitute IDL for CRQL when MDL $>$ CRQL), is the difference** between sample and duplicate:

$>$ CRQL? ___ []

$>$ 2 x CRQL? ___ []

ACTION:

If the difference is greater than the CRQL, flag (J) as estimated the associated sample data \geq CRQL.

If the difference is greater than 2xCRQL, reject the associated sample data \geq CRQL.

Note:

Only the field duplicate pair data are to be qualified.

A.1.19.4 Soil/Sediment

Circle on each Form VI all values that are:

RPD $> 50\%$, or Difference $> 2 \times$ CRQL*

When sample and duplicate values are both greater than or equal to 5 times CRQL (substitute MDL for CRQL when MDL $>$ CRQL),

is any RPD $\geq 70\%$? ___ [✓]

is any RPD $\geq 120\%$? ___ [✓]

ACTION:

If the RPD is $\geq 70\%$ but $< 120\%$, flag (J) as estimated the associated sample data \geq CRQL.

If the RPD is equal to or greater than 120%, reject the associated sample data \geq CRQL.

When the sample and/or duplicate value(s) are less than 5 times CRQL (substitute MDL for CRQL when MDL $>$ CRQL), is the difference** between sample and duplicate:

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	<u>YES</u>	<u>NO</u>	<u>N/A</u>
> 2 x CRQL*?	—	<input checked="" type="checkbox"/>	—
> 4 x CRQL?	—	<input checked="" type="checkbox"/>	—

ACTION:

If the difference is greater than 2xCRQL, flag (J) as estimate the associated sample data \geq CRQL. If the difference is greater than 4xCRQL, reject the associated sample data \geq CRQL.

**Use absolute values of sample and duplicate to calculate the difference.

A.1.20 Laboratory Control Sample) - (Form VII) *N/A AS PER TDF.*
(Note: LCS - not required for aqueous Hg; a distilled ICV may be used as LCS for cyanide analysis).

A.1.20.1 Was one LCS prepared and analyzed for:

each SDG?	<input checked="" type="checkbox"/>	—	—
each matrix type?	<input checked="" type="checkbox"/>	—	—
each batch samples digested/distilled?	<input checked="" type="checkbox"/>	—	—
for each Method(ICP-AES, ICP-MS, Hg, CN) used?	<input checked="" type="checkbox"/>	—	—
Was an LCS prepared and analyzed with the samples?	<input checked="" type="checkbox"/>	—	—

ACTION:

If no for any of the above, prepare Telephone Record Log and contact CLP PO or TOPO for submittal of the LCS results. Flag (J) as estimated all the data for which an LCS was not analyzed.

NOTE:

If only one LCS was analyzed for more than 20 samples, then the first 20 samples analyzed are not estimated (J), but all additional samples must be qualified (J).

A.1.20.2 Aqueous LCS

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YES NO N/A

Circle on each Form VII the LCS percent recoveries outside control limits (80 - 120%) except Ag and Sb (an aqueous LCS is not required for mercury or cyanide).

Is any LCS recovery:

less than 50%? _____ ☐ ✓

between 50% and 79%? _____ ☐ ✓

between 121% and 150%? _____ ☐ ✓

greater than 150%? _____ ☐ ✓

ACTION:

If LCS recovery is less than 50%, reject (red-line) all associated sample data;

for a recovery between 50 - 79%, flag (J) all associated sample data as estimated;

if the recovery is between 121- 150%, flag all positive results(not flagged with "U") as estimated;

if the recovery is greater than 150%, reject all positive results.

A.1.20.3 Solid LCS

If an analyte's MDL is equal to or greater than the true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Is LCS "Found" value greater than the control limits on Form VII? _____ ☒

ACTION:

If yes, qualify all associated positive data as estimated (J).

Is LCS "Found" value lower than the Control limits on Form VII? _____ ☒

ACTION:

If yes, qualify all associated data as estimated (J).

A.1.21 ICP-AES & ICP-MS Serial Dilutions - (Form VIII)**NOTE:**

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YES NO N/A

ACTION:

If the Percent Difference (%D) is greater than 10%, qualify as estimated (J) all associated samples with raw data > MDL; reject (red-line) all associated samples with raw data > MDL if the %D is $\geq 100\%$.

A.1.22 Dissolved/Total or Inorganic/Total Analytes -A.1.22.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s)? ___ []

Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)? ___ []

NOTE:

1. If yes, prepare a form (Appendix) comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the dissolved to the total analyte only when the dissolved concentration is $\geq 10 \times$ MDL and greater than the total concentration.

2. Apply the following questions only when both of the following conditions are fulfilled:
(i) the inorganic or dissolved results are greater than or equal to $10 \times$ MDL, and
(ii) greater than the total concentrations.

3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.

A.1.22.2 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%? ___ []A.1.22.3 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%? ___ []ACTION:

If the percent difference is greater than 10%, flag (J) both dissolved(or inorganic) and total concentrations as estimated.

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YES NO N/A

If the difference is more than 50%, reject
(red-line) both the values.

A.1.23 Field Blank - (Form I)

Note: Designate "Field Blank" as such on Form I.

A.1.23.1 Is a Field/Rinsate blank analyzed with the
samples?

[]

✓

Circle all field blank values on Form I that are
greater than CRQL, (or 2 x MDL when MDL > CRQL).

Is the field blank absolute concentration less
than the CRQL (or 2 x MDL when MDL > CRQL)
for all parameters?

[]

Is the preparation blank value greater than the
field blank value?

[]

If no for any of the above, is the field blank
value already rejected due to other QC criteria?

[]

ACTION:

If no, reject (except field blank results)
all associated positive sample data less
than or equal to five times the field blank
value. Reject on Form I's the soil sample
results that when converted to u/L on wet
basis are less than or equal to five times
the field blank value in u/L.

Note:

1. Field blank result(s) previously rejected
due to other criteria is not valid.
2. Do not use rinsate blank for soils to
qualify water samples and vice versa.

A.1.24 Verification of Instrumental Parameters - (Form IX, XA, XB, XI)

A.1.24.1 Is verification report present for:

N/A AS PER TDF.

Method Detection Limits (annually)?

[]

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	<u>YES</u>	<u>NO</u>	<u>N/A</u>
ICP-AES Interelement Correction Factors (annually)?	[]	___	✓
ICP-AES & ICP-MS Linear Ranges (quarterly)?	[]	___	✓

ACTION:

If no, contact Regional CLP PO/TOPO.

A.1.24.2 Method Detection Limits - Form IX*N/A AS PER TDF.*

A.1.24.2.1 Are MDLs present for:

all the analytes?	[]	___	✓
all the instruments used?	[]	___	✓
all ICP-AES and ICP-MS when multiple instruments are used for the same analyte?	[]	___	✓

ACTION:

If no for any of the above, prepare Telephone Record Log and contact laboratory.

A.1.24.2.2 Is MDL greater than the CRQL for any analyte? ___ [] ✓

If yes, is the concentration on Form I greater than 5 x MDL for the sample analyzed on the instrument whose MDL exceeds CRQL?

[] ___ ✓

Action:

If no, flag as estimated (J) all values less than five times MDL for the analyte whose MDL exceeds the CRQL.

A.1.24.3 Linear Ranges - Form XI *N/A AS PER TDF.*

A.1.24.3.1 Was any sample result higher than the high linear range for ICP-AES or ICP-MS? ___ [] ✓

Was any sample result higher than the highest calibration standard for mercury or cyanide? ___ [] ✓

If yes for any of the above, was the sample diluted to obtain the result on Form I? [] ___ ✓

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YES NO N/A

ACTION:

If no, flag (J) the positive result reported on Form I as estimated.

A.1.25 ICP - MS Tune Analysis - (Form XIV)

A.1.25.1 Was the ICP-MS instrument was tuned prior to calibration? []

ACTION:

If no, reject all sample data for which tuning was not performed.

A.1.25.2 Was the tuning solution analyzed at least five times consecutively? []

Were all the required analytes spanning the analytical range present in the tuning solution? []

Was the peak width at 5% peak height less than than 0.75 amu (0.80 amu for certain instruments) for each isotope in the tuning solution? []

Was the mass resolution within 0.1 amu for each isotope in the tuning solution? []

Was %RSD less than 5% for each isotope of each analyte in the tuning solution? []

Action:

If no for any of the above, qualify all associated sample results as estimated.

A.1.26 ICP-MS Internal Standards - (Form XV)

A.1.26.1 Were the internal standards added to all the samples and all QC samples and calibration standards (except the Tuning Solution)? []

Were the target analyte masses bracketed by the masses of the internal standards? []

Action:

If no for any of the above, reject the affected analyte by the internal standard masses.

A.1.26.2 Was any internal standard %RI for a sample outside the limits (60-125%)? []

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

ACTION MEMORANDUM

DATE: SEP 30 2005

SUBJECT: Request for a CERCLA Removal Action at the Matteo Iron and Metal Site,
West Deptford, Gloucester County, New Jersey

FROM: Nick Magriples, On-Scene Coordinator
Removal Action Branch

A handwritten signature in black ink, appearing to read "Nick Magriples", is written over the printed name and title.

TO: George Pavlou, Director
Emergency and Remedial Response Division

THRU: Richard C. Salkie, Chief
Removal Action Branch

Site No.: KD

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval for a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action at the Matteo Iron and Metal Site (Site), West Deptford, Gloucester County, New Jersey. The Site meets the criteria for a removal action under the CERCLA as described in Section 300.415 of the National Contingency Plan (NCP).

The total removal action project ceiling for this action is \$134,000, of which \$107,000 is for contract mitigation and will be funded from the Regional removal allowance. There are no nationally significant precedent-setting issues associated with the proposed removal action.

II. SITE CONDITIONS AND BACKGROUND

The Comprehensive Environmental Response, Compensation and Liability Information System ID Number for the Site is NJD011770013. The removal action is considered time-critical.

A. Site Description**1. Removal Site Evaluation (RSE)**

In May 2004, the New Jersey Department of Environmental Protection (NJDEP) completed a Remedial Investigation (RI) and a Remedial Action Selection Evaluation for the Site. In February 2005, the United States Environmental Protection Agency (EPA), Removal Action Branch (RAB) received a verbal request from the NJDEP to assess the Site for removal action consideration. EPA subsequently received information from the NJDEP concerning the contamination at the Site. NJDEP submitted a written request to EPA on June 6, 2005 to consider the Site for a CERCLA removal action.

Several site visits were conducted by the RAB between March and April 2005. It was observed that the active scrap yard is only fenced on the eastern boundary along Crown Point Road and a portion of the northeast corner. The scrap recycling facility receives metal from customers who drive onto the pavement on the eastern portion of the scrap yard and then onto a weight scale. Customers drop off metal at various locations in the yard, depending on the type of material being delivered and its designated collection point at the facility. Some of the collection points are situated on the unpaved areas of the yard. The unpaved area consists of disturbed soil due to the heavy machinery that tracks through this area and from efforts by the company to cleanup the yard of excessive scrap metal. It was observed that there would be a potential for dust to be generated in this operation under dry weather conditions. Based upon site observations, soil was apparently being transferred by vehicular tracking from the unpaved portion of the yard to the paved areas leading towards the entrance of the facility, indicating the potential for offsite migration.

During the tour of the Site, five intact 55-gallon drums and drum remnants were identified scattered in the woods located in the southeast portion of the Site between the scrap yard and the automobile repair shop. These drums appeared old and rusted. Some had no bung caps and were laying on their sides. The area in which these drums were present was within 100 feet of Crown Point Road and readily accessible.

Crushed battery casings are present throughout most of the northern portion of the Site. The casings visibly protrude from the ground surface, including along the banks of Hessian Run. Casings are also evident in the tidal marshlands. Observations made during extensive test pits conducted by the NJDEP revealed that most of the buried battery casings extend beyond the shoreline that existed in the 1940's.

Trails are present throughout the Site from off-site areas. There are at least seven established trails into the southern portion of the Site. Most of these trails lead directly to or near the trailer park. In addition, the central portion of the Site where the crushed battery casings are land filled is accessible via land from the rear of the scrap yard. Aside from some of the dump areas, the landfill and the trails, most of the Site is heavily vegetated. Crushed casings were evident inland

along the northern portion of the Site. Relatively new glass bottles, beer cans, shot gun shells, cap gun ammo, and other materials were observed, indicating that the Site is accessed and used for recreational purposes. The remnants of a campfire were noted on the landfill in the northwest portion of the Site in the vicinity of crushed battery casings. This campfire was situated at the end of a trail leading directly from the trailer park. An unvegetated circular area was noted near the campfire which may be used for riding bikes and all-terrain vehicles. The southern edge of the landfill area is less than 400 feet from the trailer park. During the initial site visit, two youths were observed in the central portion of the field walking westward on the Site.

During the period April 27-29, 2005, EPA personnel and contractor representatives from the Removal Support Team (RST) and the Site Assessment Team (SAT) conducted a sampling event at the Site to support an Integrated Assessment (IA). The effort included the collection of 82 surface soil samples from the Site, the adjacent trailer park, and the one adjoining residence east of the scrap yard. The samples were screened in the field using an X-Ray Fluorescence (XRF) unit for lead and an Immunoassay method for PCBs. Approximately 20% of the field-screened samples were sent to a Contract Laboratory Program (CLP) lab for analysis using Inductive-Coupled Plasma (ICP) emission spectroscopy for Target Analyte List (TAL) Metals confirmation and Pesticide/PCBs confirmation analyses. One of the five drums identified in the southeast portion of the Site was found to contain some liquid. A sample collected for Hazard Categorization (Hazcat) field screening analysis did not identify any hazards and it was concluded that the sample was likely dirty rain water.

During the April 27-29, 2005 assessment activities at the Site, standing water was observed on at least half of the Site from the flooding that had occurred along the Delaware River earlier in the month. It was reported at the time of the flooding that a dense-grade aggregate barrier was erected by the owner of the trailer park along a portion of the boundary between the trailer park and the Site. It primarily extended along the northwestern edge of the trailer park and was several feet high at its maximum height. The purpose apparently was to keep flood water from retreating from the Site back through the trailer park on its way to Woodbury Creek. The western portion of the trailer park was reportedly flooded during this period.

The known key problem areas at the Site include: the crushed battery casings throughout the northern portion of the Site, along the southern bank of Hessian Run and within its sediments; the on-site contaminated soils; and the contaminated sediments in Hessian Run.

2. Physical location

The Site is located at 1708 U.S. Highway 130 (a.k.a Crown Point Road) in West Deptford, Gloucester County, New Jersey and is situated just west of Interstate Highway 295/Route 130 (see Figure 1). The eastern portion of the Site, approximately 5 acres, is partially paved with asphalt and contains several buildings which support an active scrap metal recycling business. The remainder of the Site, approximately 75 acres, is comprised predominantly of heavily vegetated, undeveloped land which is bordered by Woodbury Creek to the west, Hessian Run to the north, and a residential trailer park to the south. There are at least 100 hundred trailers

present in the park. A residence and an automobile repair shop are situated to the east and southwest of the scrap yard, respectively. Two buried utility lines pass through the northwestern portion of the Site.

The Site is located approximately 1.2 miles from the Delaware River at the confluence of Woodbury Creek and Hessian Run. According to the RI, tidal fluctuations range from approximately 5.4 feet at neap tides to approximately 6 feet at spring tides. Tidal currents are strong in this area. At low tide, Woodbury Creek is ten feet deep, whereas Hessian Run becomes a narrow stream less than a foot deep. Based on floodplain data, at least two-thirds of the Site is situated within the 100-year flood plain at nine feet above mean sea level. The flood conditions that occurred in April 2005 were commensurate with this type of inundation.

The Site is situated in the Woodbury-Hessian Run marshes, which are freshwater tidal marshlands (see Figure 2). Woodbury Creek has one of the largest remaining tidal freshwater wetlands on the Delaware River. The tidal marshes are flat and regularly flooded by slightly brackish tides. These marshes are considered to be part of the Delaware River Estuary. Both the NJDEP Freshwater Wetland Map and the National Wetland Inventory (NWI) Mapping identify wetland habitats in and around the Site. The tidal reach of the Delaware River is part of the National Estuary Program, a program set up to protect estuarine systems of national significance.

The Site provides habitat for a variety of wildlife species due to the diversity of habitat types present and its location adjacent to a freshwater tidal marsh. The marshes provide habitat for muskrat, ducks and geese. According to the RI, the following fish species have been identified in Woodbury Creek and Hessian Run: mummichog, banded killifish, silvery minnow, alewife, blueback herring, pumpkinseed, brown bullhead, white perch, American eel, goldfish, spottail shiner, carp, bluntnose minnow, black crappie, gizzard shad, eastern mudminnow and golden shiner. According to the Atlantic Coast Ecological Inventory, the Delaware River Estuary contains game fish such as the American shad and the striped bass.

Of the bird species observed at the Site during the RI, the osprey is listed as threatened by the NJDEP Division of Fish and Wildlife. According to the NJDEP Endangered Nongame Species Program, the northern and western portions of the Site and the Woodbury-Hessian Run marshes are considered foraging locations for the bald eagle (see Figure 3). The bald eagle is listed by the U.S. Fish and Wildlife Service as threatened. The NJDEP Division of Fish and Wildlife considers the bald eagle breeding population as endangered and their non-breeding population as threatened.

Groundwater is the source of drinking water within a four-mile radius of the Site. Municipal wells provide the vast majority of this potable water. There are three private water supply wells in the immediate area of the Site; the scrap yard, the residence located adjacent to the scrap yard to the east, and the automobile repair shop located adjacent to the scrap yard to the southwest. The latter of these wells is 103 feet in depth. The depth of the other wells is not known. It is reported that the wells at the scrap yard and the adjacent automobile repair shop are not used for potable purposes. The residential well is used for potable purposes and has a treatment system

reportedly consisting of a 5-micron filter and a three-stage charcoal and sand filter. There are three municipal wells situated within one mile of the Site. The West Deptford Municipal Well No. 6, which is located on Red Bank Avenue near Oakland Road, is located 0.6 miles southeast of the Site and pumps approximately 100,000 gallons per day. This well is 356 feet in depth. National Park Borough operates two wells approximately 280 feet in depth, 0.9 miles northwest of the Site.

The groundwater table is approximately ten feet below the ground surface at the Site. According to the RI, the primary flow of the ground water is towards the southeast. A perched water table exists in the eastern portion of the Site. On the far eastern edge of the Site, the perched water flows to the north into Hessian Run. The remainder of the perched water flows towards the center of the Site and connects with the regional ground water flow heading towards the southeast. It is reported that Woodbury Creek and Hessian Run generally discharge into the ground water except during low tide, when seepage of ground water to the tidal mud flats occur.

3. Site characteristics

The Matteo family acquired the property on which the Site is located in 1947 and reportedly operated a junkyard, recycling facility, and an unregistered landfill since approximately 1961. The NJDEP identified an inactive incinerator at the Site in 1968. The unregistered landfill accepted crushed automotive battery casings and industrial and domestic waste. In 1971, the NJDEP approved a request from the facility to operate the incinerator to burn copper wire and received a plan from the facility for a "sweating fire box" to melt lead battery terminals for lead reclamation. An inspection in 1974 revealed that the approved incinerator was being used to smelt battery parts. The lead melting operation continued until 1985. In 1972, the NJDEP observed landfilling of crushed battery casings in an area of wetlands adjacent to Hessian Run. This operation was apparently performed in conjunction with the lead melting operation, as there were several reports of battery casing incineration and subsequent on-site ash and waste products disposal. At one time, the owner claimed that the crushed battery casings were intended for sale for use in road projects, driveways, and other recycling uses. In 1976 and 1984, there were reports of fires burning at the landfill. The fires involved the waste material that had been placed in the landfill. During the former period, it is reported that the fire burned for three days. In addition to these operations, numerous inspections and complaints through the years revealed drums of waste scattered throughout the property, including in the wooded area near the trailer park. In 1984, drums of D001 and D008 waste were identified at the Site.

Currently, Matteo Iron and Metal operates a scrap metal recycling facility on a portion of the Site closest to Crown Point Road. According to a recent price sheet, the company accepts copper, brass, aluminum, stainless steel, iron, lead, motors, junk cars and batteries. The batteries, which reportedly are a very small part of the business since they are not assigned any value, are reportedly shipped off as received without any lead recovery. A portion of the scrap yard is paved near the entrance and the weigh station. The remainder of the scrap yard is unpaved. Soil contamination has been documented in the unpaved portion of the scrap yard. The remainder of the Site west of the scrapyards is not currently used.

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

Numerous limited investigations and sampling events have been conducted at the Site over the past several decades. In 1991 during a test pit study conducted by the NJDEP, lead was detected at 39,200 mg/kg at a depth of four feet and total petroleum hydrocarbons were identified at a depth of three feet at 44,600 mg/kg. Surface soil sampling conducted in the junkyard in 1996 by the NJDEP identified the following analytes with their maximum concentrations: lead (19,900 mg/kg), copper (21,100 mg/kg), cadmium (49.6 mg/kg), and arsenic (59.2 mg/kg). Test pits conducted by the NJDEP in 1996 identified the presence of lead at 47,900 mg/kg at a depth of twelve feet. Sediment sampling conducted in 1997 by the NJDEP as part of the Site Investigation (SI) identified lead (8,500 mg/kg) and PCBs (78 mg/kg) in Hessian Run adjacent to the central portion of the crushed battery casing area.

The NJDEP conducted a comprehensive RI during the period of September 2000 to October 2002. The analytical data generated by the NJDEP during the RI revealed elevated levels of lead in the soil throughout the battery casing burial area, the scrap yard, and the adjoining creek sediments around the Site. Additionally, there are noncontiguous spots of soil contamination throughout the Site. PCBs, antimony, copper, arsenic, cadmium, mercury, nickel and zinc were also detected at some locations above NJDEP Nonresidential Direct Contact Soil Cleanup Criteria (NRDCSCC) and Residential Direct Contact Soil Cleanup Criteria (RDCSCC). There were also sporadic detections of polyaromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) in the shallow subsurface soil.

Soil sampling conducted during the RI within the unpaved portion of the scrap yard revealed the presence of elevated levels of lead, especially in the central area just northwest and west of the pavement. The maximum concentration of lead detected in the soils in this area, at a depth of zero to six inches, was 20,700 mg/kg. The average lead concentration of the soil samples collected in this area, at a depth of zero to twelve inches, was 3,429 mg/kg. According to estimates in the RI, approximately 75% of the six-acre scrap yard is above the NJDEP RDCSCC for lead (400 mg/kg). Table 1 lists a summary of the analysts/compounds identified in surface samples collected in the scrap yard and their respective maximum concentrations.

Table 1: Summary of Analytical Results from Surface Soil Samples Collected in the Scrap Yard at the Matteo Iron and Metal Site (NJDEP RI, March 2004).

Substance	Maximum Concentration Detected (mg/kg)	NJDEP RDCSCC (mg/kg)	NJDEP NRDCSCC (mg/kg)
antimony	865	14	340
arsenic	55	20	20
cadmium	33.3	39	100

copper	2,870	600	600
lead	20,700	400	600
mercury	22.3	14	270
nickel	502	250	2,400
zinc	16,200	1,500	1,500
PCBs	216	0.49	2

Soil samples collected from the 90 test pits completed throughout the Site during the RI revealed a maximum lead concentration of 31,300 mg/kg within the buried waste, at a depth of 1.5 feet, and 11,500 mg/kg below the waste, at a depth of five feet. A test pit along the western boundary of the Site revealed PCBs at a concentration of 460 mg/kg at a depth of 4.5 feet and xylene at a concentration of 280 mg/kg at a depth of three feet. Two of five waste characterization samples collected from soil in the buried waste areas exceeded the Toxicity Characteristic Leaching Procedure (TCLP) limit for lead (5.0 mg/l). One of the two samples that exceeded the TCLP limit was collected from a battery waste area and the other was from a mixed waste area.

Surface soil samples collected during the RI outside of the immediate areas of the scrap yard and the burial areas revealed noncontiguous spots of soil contamination throughout the Site. The lead concentrations in four of the nineteen samples collected ranged from 1,660 mg/kg to 14,500 mg/kg, with the latter concentration being within 50 feet of the trailer park and in the general area of a trail leading onto the Site. The PCB concentrations in two of the nineteen samples ranged from 0.53 mg/kg to 15.2 mg/kg.

Surface soil sampling conducted by EPA within the landfill area during April 2005 generally confirmed previous sample results in the landfill and battery casing burial area with respect to the lead contamination. Soil samples collected in an area of the Site near the border with the trailer park, did not confirm a previous detection of lead at 14,500 mg/kg. The maximum XRF lead concentration from four samples collected in this general area was 277 mg/kg. Three samples collected from lawns in the trailer park, just south and southeast of this area, detected lead at estimated laboratory concentrations of 1,520 mg/kg, 973 mg/kg, and 410 mg/kg. The XRF screening results for these samples were 906 mg/kg, 715 mg/kg and 306 mg/kg, respectively. The lead concentrations within the remainder of the trailer park were all below 200 mg/kg. The four samples collected from the curb on Crown Point Road, outside of the scrap yard entrance and on a dirt roadway that separates the scrap yard and the single residence situated east of the scrap yard, were all below a lead concentration of 400 mg/kg. A sample collected from the eastern lawn of this residence detected lead at an estimated laboratory concentration of 1,400 mg/kg. With respect to PCBs, one sample collected near Hessian Run from within a crushed battery burial area revealed the presence of PCB Aroclor-1254 at an estimated concentration of 200 mg/kg.

During the RI, 416 sediment samples were collected to a depth of three feet from Hessian Run and Woodbury Creek. Lead concentrations in sediment samples exceeded the NJDEP Sediment Quality Criteria Severe Effect Level (SEL) of 250 mg/kg at all of the sampling locations along Hessian Run, with the most contaminated area generally being closest to the central portion of the north shoreline of the Site. The NJDEP Sediment Quality Criteria Lowest Effect Level (LEL) of 31 mg/kg for lead was exceeded at all locations sampled. The maximum concentration of lead detected in the sediments was 35,200 mg/kg at a depth of one to two feet in Hessian Run near the north shoreline. Lead was also detected as high as 19,500 mg/kg at one location near the north shoreline at a three foot depth, the maximum depth sampled. The concentrations of lead in the sediments generally decrease with distance from the north shoreline. PCB concentrations in sediment samples exceeded the SEL (varies based on total organic carbon concentrations) at two locations in Hessian Run. The maximum concentration of PCBs detected was 8.3 mg/kg from the upper six inches of Hessian Run near the creek bank. Arsenic, copper, and zinc also exceeded their respective SELs in Hessian Run near the creek bank.

Surface water samples collected from locations in both Hessian Run and Woodbury Creek during the RI revealed the presence of lead above NJDEP Surface Water Quality Standards (SWQS) ecological criteria (2.5 ug/l) in 20 of the 24 samples and above SWQS human criteria (5 ug/l) in 16 of the 24 samples. The highest lead concentration detected was 87.4 ug/l. In general, samples (unfiltered) collected at low tide had higher concentrations than those collected at the same location at high tide.

As part of the RI, the NJDEP completed an ecological study in the summer of 2003 and issued the Final Aquatic Biota Study in December 2004. Sediment and water samples were collected from ten stations upstream, adjacent to, and downstream of the Site covering both Hessian Run and Woodbury Creek. The stations were located within the main channels of these streams. The highest sediment concentrations of lead and PCBs, 19,600 mg/kg and 35 mg/kg, respectively, were confirmed in Hessian Run at adjacent stations near the central portion of the burial area.

Ground water monitoring conducted at the Site has revealed the presence of lead (6,050 ug/l), nickel (174 ug/l), chromium (164 ug/l), and cadmium (4.4J) in the shallow monitoring wells. Vinyl chloride has been identified in the deep monitoring wells at concentrations as high as 20 ug/l. In May 2004, the NJDEP installed four monitoring wells east of Interstate Highway 295. Three of the wells are located within 0.3 miles of the Site and range in depth from 79 to 92 feet. The highest level of vinyl chloride identified in the off-site monitoring wells is 26 ug/l. Lead was detected in the on-site potable well in 1994 at 57 ug/l. Vinyl chloride has been detected at a maximum concentration of 4.8 ug/l in the potable well of the adjacent tire business. Neither of these wells are reportedly used for potable purposes. The EPA Drinking Water RAL for lead and vinyl chloride are 30 ug/l and 2 ug/l, respectively.

All of the materials listed above, except for petroleum hydrocarbons, are CERCLA designated Hazardous Substances, as listed in 40 CFR Table 302.4. The analytical data presented above is a summary of the most significant data available from the aforementioned reports. It is not meant to be inclusive of all of the analysts or compounds detected at the Site.

Based on test pits conducted during an NJDEP field investigation, the volume of waste material landfilled at the Site is estimated to be 80,000 cubic yards (see Figure 3). Of this total, approximately 23,000 cubic yards consists of battery casings, 22,000 cubic yards of battery casings mixed with general waste, and 35,000 cubic yards of general waste. It is estimated that there are an additional 7,000 cubic yards of battery casings in the sediments of Hessian Run to a depth of three feet, as measured 20 feet from the south bank. Not including the area covered by the battery casings in the sediments of Hessian Run, there are approximately 10,500 cubic yards of sediments to a depth of one foot with contamination greater than the NJDEP SEL Sediment Quality Criteria and approximately 99,500 cubic yards of sediments to a depth of three feet with contamination greater than the SEL. The volume of soil contamination (not including the battery casings) identified above NJDEP RDCSCC across the entire Site is estimated to be 58,000 cubic yards.

The mechanism for past releases to the environment was the business operations and waste disposal practices at the Site. Metals, in particular lead, were recovered from batteries and wiring since the 1950s. Waste materials including: crushed batteries casings, residues from the smelting operation and unknown industrial and domestic solid waste were reportedly deposited at the Site and buried over a period of several decades. The crushed battery casings make up a significant portion of the southern bank of Hessian Run at the Site. The bank of the creek was altered from its original location by the filling operations conducted over the decades.

The presence of exposed, crushed battery casings deposited along Hessian Run over several decades is indicative that there is an ongoing release to the environment. Casings are also evident in the Hessian Run sediments. During low tide, wide mud flats are exposed over which contaminated stored water from the battery casing area flows. Both Hessian Run and Woodbury Creek are tidal and flood the Site during elevated flows on the Delaware River. The flood waters that pass over the Site would tend to cause migration from the highly contaminated areas into the adjacent creeks and other portions of the Site. Flooding of this nature occurred in April 2005 during a period of heavy rainfall and snow melt in the Delaware River Basin. The Site is accessible and is used for recreational purposes. The potential for direct contact with the contaminated soil and crushed battery casings exists that could potentially lead to exposures through inhalation and ingestion.

Future releases of elevated levels of lead and other CERCLA designated Hazardous Substances will continue unabated to Hessian Run should conditions remain unmitigated. Materials released could migrate to areas that have not yet been impacted, affecting human health and the environment.

5. National Priorities List (NPL) status

The Site is not on the NPL. EPA has evaluated the Site for placement on the NPL and has prepared a draft Hazard Ranking System (HRS) package. EPA is awaiting for NJDEP to determine if they want to place the Site on the NPL.

B. Other Actions to Date**1. Previous actions**

There have been no previous Federal actions taken at the Site other than those discussed previously.

2. Current actions

Currently, there are no Federal actions taking place at the Site.

C. State and Local Authorities' Role**1. State and local actions to date**

The NJDEP has been involved with the Site since at least 1972 with inspections of the landfilling and melting operations. An Administrative Order was issued to the company in 1984 with respect to their waste disposal practices for incinerator ash, a pile of white powder, and drums. The company was issued a Notice of Violation (NOV) in 1991 for significant amounts of solid waste and other materials of environmental concern and subsequently conducted a site investigation. The investigation, which included test pits, revealed elevated levels of lead and total petroleum hydrocarbons at the Site. The case was transferred to the Division of Publicly Funded Site Remediation in 1993 after the company did not conduct any of the required followup investigative activities or proceed with closure of the landfill. The NJDEP conducted a PA/SI in 1996. In July 1997 the NJDEP conducted sampling of surface soils to determine if dioxin was present at the Site and the extent of PCB contamination. Analytical results did not confirm the presence of dioxin.

The NJDEP announced an initiative on April 25, 2005 for accelerating the cleanup of ten major contaminated sites along the Delaware River in an effort to improve the quality of the river. The Matteo Iron and Metal Site was identified on the list.

2. Potential for continued State/local response

At this time it is not known whether there will be any future State or local actions taken at the Site.

III. THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES**A. Threats to Public Health or Welfare**

There is a potential exposure to nearby human populations from hazardous substances, pollutants or contaminants (40 CFR §300.415(b)(2)(i)). The Site is an insecure area where automotive

batteries were received and either burned or crushed to recover metal. Persons use the inactive portion of the Site for recreational purposes. It appears that the main area of interest is the northwest portion of the Site, within what constitutes the landfill and battery casing area. One of the main paths from the trailer park leads to this area, which is sparsely vegetated and is the location of the campfire remnants. From there, a trail leads to Hessian Run and the exposed battery casings. Persons accessing the Site could potentially be exposed to elevated levels of lead and PCBs through inhalation and/or ingestion of dust or through dermal contact. Use of bicycles or all-terrain vehicles in this area could kick up dust, increasing the risk for potential exposure.

The active portion of the Site is used by workers of the scrap metal recycling facility and customers dropping off material. Heavy machinery is used on the unpaved portion of the facility to segregate, consolidate and prepare the scrap metal for transport. Lead, PCBs and other heavy metals have been documented in the surface soils of the unpaved area. Persons accessing this area could potentially be exposed to elevated levels of lead and PCBs through inhalation and/or ingestion of dust generated by the operations or through dermal contact.

There appears to be an isolated area of lead contamination above the NJDEP RDCSCC in the north central portion of the residential trailer park along the border with the Site. Lead was also detected above the NJDEP RDCSCC in a sample collected on the lawn of the residence situated east of the scrap yard. As such, there is a potential for exposure to lead for persons in these through inhalation and/or ingestion of the soil. Although the samples in the residential locations were collected from grass lawns, which lessens the potential for dusty conditions, the exposure potential is dependent on the quality of the grass cover and the activities that take place over the lawn.

Evidence exists that Hessian Run and Woodbury Creek are used for recreational purposes. There are boat docks and duck blinds present on Hessian Run. This indicates that persons may hunt and fish, providing a potential human exposure pathway if the wildlife are consumed. Lead and PCBs have been identified extensively in the surrounding tidal wetlands ecosystem.

Lead is a cumulative poison where increasing amounts can build up in the body eventually reaching a point where symptoms and disability occur. Particularly sensitive populations are women of child-bearing age, due to the fetal transfer of lead, and children. Cognitive deficits are associated with fetal and childhood exposure to lead. An increase in blood pressure is the most sensitive adverse health effect from lead exposure in adults. Effects on the kidney, nervous system and heme-forming elements are associated with increasing blood lead concentrations, both in children and adults. Other symptoms include: decreased physical fitness, fatigue, sleep disturbance, aching bones, abdominal pains and decreased appetite.

The relationship between soil lead concentrations and the consequent impact on blood levels in children has been studied through numerous epidemiological studies. Based on these epidemiological studies, it is generally believed that persistent exposure to soil-borne lead results in an increase in blood lead levels (in children) of 1 to 9 ug/dl per 1,000 ppm lead in soil. Although this relationship may become less robust as exposure durations decrease and soil lead

levels increase, it nonetheless provides compelling evidence of the potential lead hazard associated with the excessive lead concentrations found in the soil at the Site.

PCBs are readily absorbed into the body by ingestion, inhalation, and dermal exposure following ingestion of dust or soil, inhalation of PCB-laden dust, or direct dermal contact with PCBs in soil or dust. They may persist in tissues for years after exposure stops. Chemical acne, dark patches on skin, burning eyes and skin and unusual eye discharge have been reported by all routes of exposure. Generally, onset may not occur for months. These effects may last for months. Liver damage and digestive disturbance have been reported. PCBs may impair the function of the immune system and at high levels have been shown to produce cancer and birth defects in laboratory animals. Although PCBs are suspected as a human carcinogen, they have a very low potential for producing acute toxic effects. PCBs bioaccumulate to concentrations that are toxic. A number of human studies indicate that PCBs can cross the placenta and locate in the fetus. PCBs also concentrate in human breast milk.

High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface, may migrate (40 CFR §300.415(b)(2)(iv)). Analytical testing has confirmed the presence of elevated levels of lead and PCBs at the Site in the upper two feet of the soil. During dry conditions this material becomes airborne more readily, especially in the active scrap yard, where the soil is more readily disturbed by heavy machinery and vehicles and near the campfire location. Persons that access the Site can accumulate the material on their shoes and possibly carry it into the home resulting in potential exposures to young children, if present. The crushed battery casings that line the southern bank of most of Hessian Run and come into direct contact with the creek itself during high tide, are a continual source of contamination to the tidal freshwater marshes.

Weather conditions exist that may cause hazardous substances to migrate or be released (40 CFR §300.415(b)(2)(v)). During flood events the potential exists for high levels of lead and PCBs to be spread across the Site to areas with lower levels of contamination and to the adjacent residential trailer park. This also increases the potential for further contaminant migration into the creeks when the waters recede. A flood event in April 2005 resulted in approximately half of the Site being inundated at approximately the 100-year flood line.

B. Threats to the Environment

There is an actual or potential exposure to nearby animals or the food chain from hazardous substances, pollutants or contaminants (40 CFR §300.415(b)(2)(i)). Acute sediment toxicity testing conducted by the NJDEP revealed that a sample collected at one of the stations in Hessian Run, across from the battery casing burial areas, showed 100% mortality to the benthic organisms tested. Significant mortality was also observed from the sediments near the western portion of the Site, including near the confluence with Woodbury Creek. Surveys conducted as part of the aquatic biota study revealed that both the indigenous benthic macroinvertebrate and fish communities were less diverse at the four stations adjacent to the Site on Hessian Run than at the reference stations. Concentrations of lead detected in the wetland plants at stations near

the Site were considerably higher than the reference stations. In earthworm tissue, lead and PCB concentrations were also considerably higher at the on-site stations than at the reference stations.

The EPA Environmental Response Team (ERT) completed an Ecological Risk Assessment in June 2005 based on the NJDEP Final Aquatic Biota Study Report. The food-chain models indicate that insectivorous birds and mammals are at risk of acute toxicity from the ingestion of lead. Insectivorous and omnivorous birds and mammals are at risk from the ingestion of lead. Insectivorous birds and mammals, omnivorous birds, and piscivorous mammals are at risk from the ingestion of PCBs. In addition, the ecological risk assessment indicates that the wildlife which utilize the area of highest site-related contamination for foraging are at risk. The risk assessment conclusions demonstrate the link between site contaminants and environmental impact in the aquatic and terrestrial ecosystem.

There is actual or potential contamination of sensitive ecosystems (**40 CFR §300.415(b)(2)(ii)**). Extensive tidal wetlands along Hessian Run and Woodbury Creek surround the Site and continue to the Delaware River. Lead and PCBs have been documented in these wetlands. According to the ERT Ecological Risk Assessment, tidal flats function as a nursery and refuge areas for small and developing aquatic organisms. Biota utilizing the tidal flat often rely extensively on the resources available during high tide when fish move to the tidal flat to feed on the resident community. Within the Delaware River system, American shad and striped bass use tidal flats for their nursery function and migration pathways. At low tide, birds and some mammals move onto the tidal flat to feed. The benthic macroinvertebrate community plays a key role in nutrient cycling and organic matter processing, and is a food resource for higher trophic level organisms. Sediment contamination has a direct impact on these organisms due to their direct contact with the media. Upper trophic level predators, such as birds and mammals, that feed on the lower trophic level organisms, can bioaccumulate contaminants that are present in an ecosystem. The osprey's presence at the Site and the bald eagle's use of the Woodbury-Hessian Run marshes as a foraging location are indicative of the ecological sensitivity of the area surrounding the Site and the risk that the CERCLA designated hazardous substances identified at the Site pose to these predators.

High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface, may migrate (**40 CFR §300.415(b)(2)(iv)**). Crushed battery casings and elevated levels of CERCLA designated hazardous substances have been identified on the banks of the Site and within sediments of Hessian Run. This waste material is unprotected and readily available to migrate. The surface water is in contact with this material and continually carries the contamination into the tidal flats, making it available for further migration into the Delaware River. This situation has existed for several decades. An impact to the local ecosystem has been documented.

Weather conditions that may cause hazardous substances, or pollutants, or contaminants to migrate or be released (**40 CFR §300.415(b)(2)(v)**). Flood events result in greater portions of the contaminated area coming into contact with the surface water and releasing material into the tidal wetlands that surround the Site. This was the case in April 2005 during a major flood event in the Delaware River watershed.

IV. ENDANGERMENT DETERMINATION

Actual or threatened release of a hazardous substance from the Site, if not addressed by implementing the response action selection in this Action Memorandum, may present an imminent and substantial endangerment to public health, welfare, or the environment.

V. PROPOSED ACTIONS

A. Proposed Actions

1. Proposed action description

The proposed action is to erect a chain-link fence and place warning signs along the portions of the Site that are not fenced and that are not bounded by waterways. These areas would include the southern boundary of the Site near the trailer park and portions of the eastern boundary where fencing does not already exist. The purpose of the proposed action is to restrict public access to the contaminated areas of the site and thereby reduce the human health threats posed by the elevated levels of CERCLA designated hazardous substances that are spread throughout the Site. The proposed action is an interim measure, designed to protect human health by attempting to minimize direct contact with the highly contaminated areas at the Site, but will not reduce the contamination levels and therefore will not alleviate the remaining human health and ecological concerns.

At the conclusion of this removal action, contamination will still exist at the Site. The proposed action will not address the issues listed below.

- The tens of thousands of tons of battery carcasses and heavily contaminated soils either in direct contact with a tidal estuary of the Delaware River or within the estuary's floodplain.
- The heavily contaminated sediments in Hessian Run.
- The presence of soil contamination at the active facility.
- The contaminated ground water underlying and downgradient of the Site.
- The availability of access to the Site along Hessian Run, Woodbury Creek and from the active portion of the Site.

Additional comprehensive response actions will be required to address the threats to human health and the environment posed by the contamination that will remain at the site, as noted above.

2. Contribution to remedial performance

The removal action at the Site will, to the extent practicable, contribute to the efficient performance of any long-term remedial action with respect to the release or the threatened release. The Site is not on the NPL, however the proposed removal action is not expected to impede any future responses. This limited action will attempt to minimize direct contact threats until a more comprehensive response action is undertaken.

3. Description of alternative technologies

Alternative technologies were not considered for the proposed action.

4. Engineering Evaluation/Cost Analysis (EE/CA)

Since this is a time-critical removal action, this section was not applicable.

5. Applicable or relevant and appropriate requirements (ARARs)

Federal ARARs were not considered due to the limited scope of this removal action.

6. Project schedule

It is expected that this removal action will take two months to complete once funding is received and the action is initiated.

B. Estimated Costs

A summary of the estimated costs for the proposed action is presented below.

Extramural Costs:

Regional Removal Allowance Costs:

Cleanup Contractor Costs (ERRS)	\$ 97,439
ERRS Costs Contingency (10%)	<u>\$ 9,743</u>

Total Cleanup Contractor Costs (ERRS) (rounded to nearest thousand)	\$107,000
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Other Extramural Costs Not Funded from the Regional Allowance

Total RST, including multiplier costs	\$ 5,000
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Subtotal, Extramural Costs	\$112,000
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Extramural Costs Contingency	<u>\$ 22,000</u>
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(20% of total Extramural Costs; rounded to nearest thousand)

TOTAL, REMOVAL ACTION PROJECT CEILING	\$134,000
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VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Should no action be taken, or the planned action delayed, access to the Site will continue unabated, continuing the risk of persons coming into direct contact with the waste material and contaminated soil present at the Site.

VII. OUTSTANDING POLICY ISSUES

None.

VIII. ENFORCEMENT

EPA has not yet completed its investigation into whether Potentially Responsible Parties (PRPs) can be identified for this Site. There have been no CERCLA 104e Request for Information Letters issued to date.

The total EPA costs for this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated to be \$195,450.

This estimate includes direct costs, which include direct extramural costs and direct intramural costs, and indirect costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgement interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual total costs from this estimate will affect the United States' right to cost recovery.

These estimated costs are summarized below:

Direct Costs = Direct Extramural + Direct Intramural Costs = \$134,000 + \$16,000 = \$150,000
 Indirect Costs = Region II Indirect Cost Rate x Direct Costs = 30.30% x \$150,000 = \$45,450
 Estimated EPA Costs for a Removal Action = Direct Costs + Indirect Costs = \$195,450

IV. RECOMMENDATION

This decision document represents the selected removal action for the Matteo Iron and Metal Site in West Deptford, Gloucester County, New Jersey, developed in accordance with CERCLA, as amended, and is not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Site conditions meet the NCP Section 300.415(b)(2) criteria for a removal action. The total removal action project ceiling for this action is \$134,000, of which \$107,000 is for contract mitigation and will be funded from the Regional removal allowance.

Please indicate your approval of this Action Memorandum for the Matteo Iron and Metal Site, as per current Delegation of Authority, by signing below.

APPROVAL: William Mc Cabe
George Pavlou, Director
Emergency and Remedial Response Division

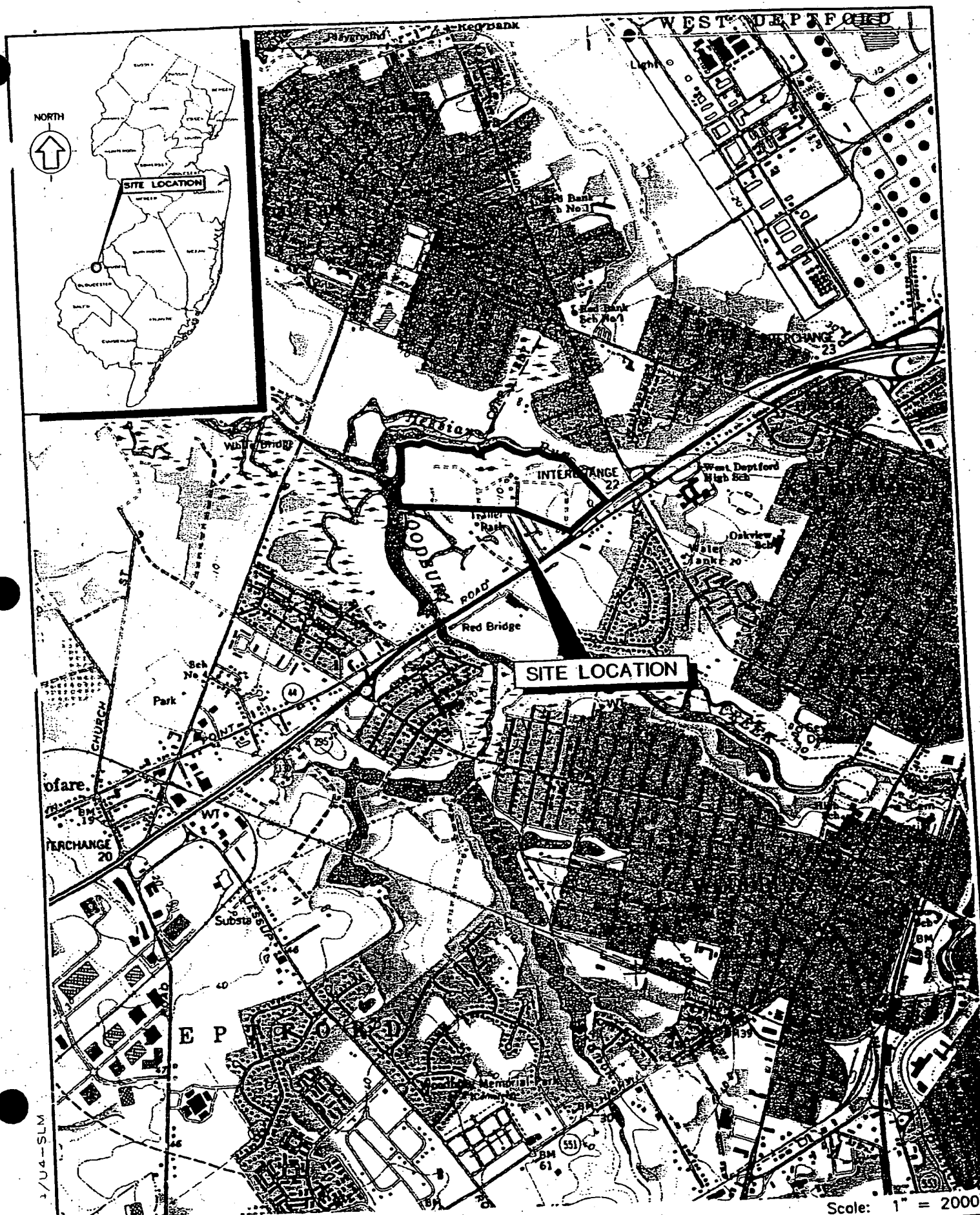
DATE: 9-30-05

DISAPPROVAL: _____
George Pavlou, Director
Emergency and Remedial Response Division

DATE: _____

cc: G. Pavolou, ERRD-D
W. McCabe, ERRD-DD
R. Basso, ERRD
R. Salkie, ERRD-RAB
J. Witkowski, ERRD-RAB
G. Zachos, ACSM/O
C. Petersen, ERRD-NJRB
D. Karlen, ORC-NJSFB
T. Mitchell, ERRD-NJRB
P. Brandt, PAD
R. Manna, OPM-FMB
T. Rivero, OPM-GCMB
D. Cristiano, ORC-NJSFB
T. Grier, 5202G
P. McKechnie, OIG
M. Pederson, NJDEP
A. Raddant, USDOJ
J. Steger, NOAA
C. Kelley, RST

Figure 1



Source: USGS 7.5 Min. Quadrangle, Woodbury, N.J.

Scale: 1" = 2000

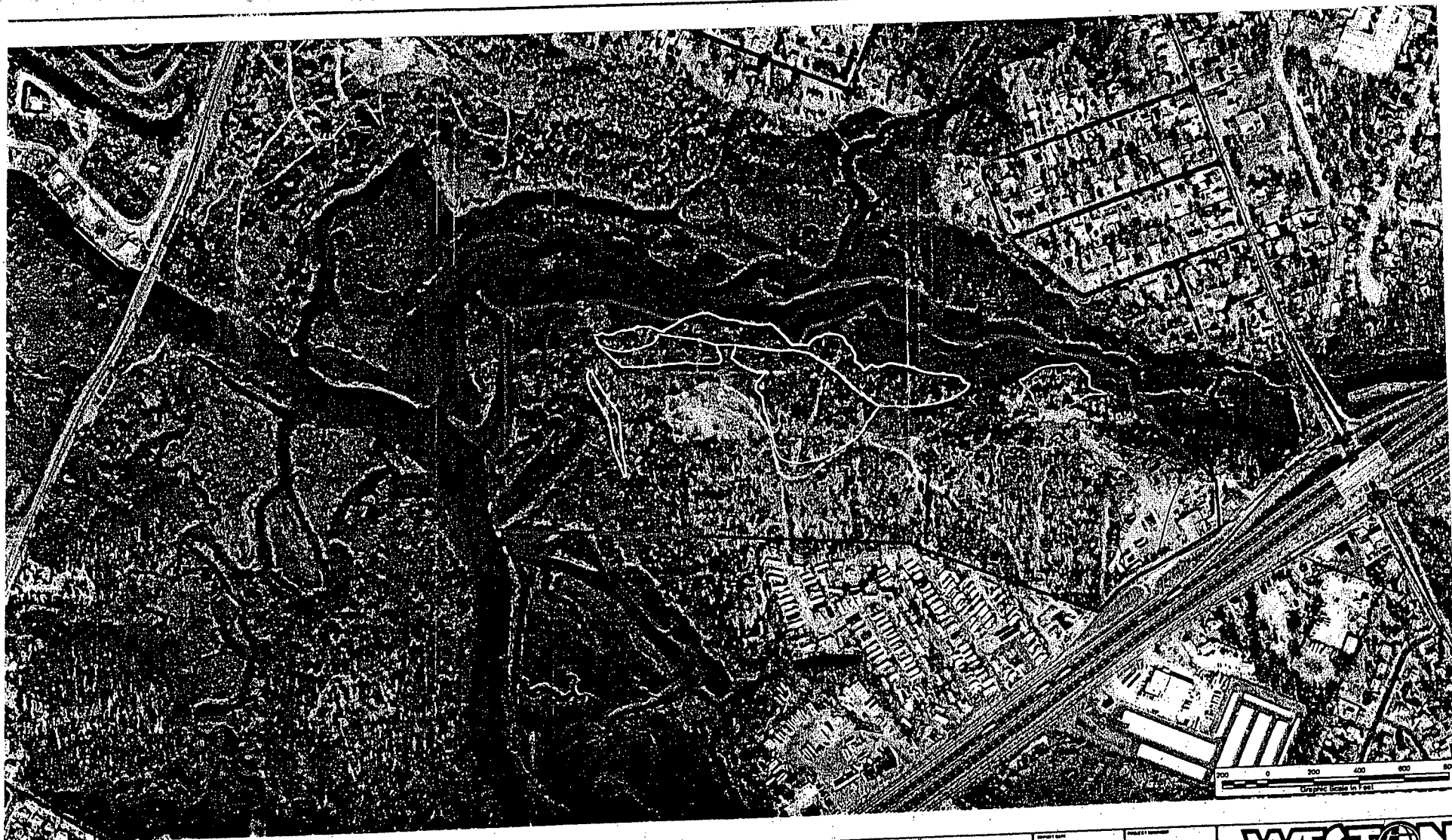
MATTEO IRON AND METALS - GLOUCESTER COUNTY,
NEW JERSEY

The Louis Berger Group, Inc.
30 Vreeland Road

FIGURE 1-

Figure 2

Figure 3



Legend

- Bald Eagle Foraging Location
- Source 1: Battery Casing Waste Pile
- Source 2: Inactive Landfill
- Approximate Boundary of Matleo Property
- Source 3: Contaminated Soil

<p>Figure 3 Bald Eagle Foraging Location Map Matleo and Sons, Inc. Thorofare, Gloucester County, NJ</p>		
<p>Scale: 1:2,400</p>	<p>Date: JUNE 2005</p>	<p>Page: 4</p>

<p>UNITED STATES ENVIRONMENTAL PROTECTION AGENCY</p>
<p>MATTEO AND SONS, INC.</p>



<p>Project Date: JUNE 2005</p>	<p>Project Manager: M. CAPRIGLIONE</p>
<p>Project No: 02080</p>	<p>Client: G. GILLIAND</p>
<p>Project Name: LYNAT Addition and Renovation</p>	<p>Contract No: 66-W-00-121</p>
<p>Project Value: 20103.001.001.1137.00</p>	<p>Contractor: J. LYNES</p>
<p>Project Start Date: 06/14/05</p>	<p>Project End Date: 06/14/05</p>



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Federal Programs Division
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REMOVAL SUPPORT TEAM
EPA CONTRACT 68-W-00-113

May 12, 2005

Mr. Nick Magriples, On Scene-Coordinator
U.S. Environmental Protection Agency, Region II
Removal Action Branch
2890 Woodbridge Avenue
Edison, NJ 08837

EPA CONTRACT NO: 68-W-00-113
TDD NO: 02-05-04-0005
DOCUMENT CONTROL NO: RST-02-F-01836
SUBJECT: Sampling Trip Report – Matteo Iron and Metal Site

Dear Mr. Magriples,

Enclosed please find the Sampling Trip Report for the sampling and inventory work conducted from April 27 through April 29, 2005, at the Matteo Iron and Metal Site, 1708 Route 130, West Deptford Township, Gloucester County, New Jersey.

If you have any questions, please do not hesitate to contact me.

Sincerely,

WESTON SOLUTIONS, INC.

Aaron Levy
Group Leader

Enclosure

cc: TDD # 02-05-04-0005



SAMPLING TRIP REPORT

SITE NAME: Matteo Iron and Metal
TDD #: 02-05-04-0005
DCN #: RST-02-F-01836

EPA I.D. NO.: KD

SAMPLING DATES: April 27 through 29, 2005

1. **Site Location:** 1708 Route 130, West Deptford Township, Gloucester County, New Jersey. (Figure 1)
2. **Sample and Activity Descriptions:** Air monitoring was conducted of an abandoned drum area. The drums, which were located in a wooded area, were then inventoried. One drum was sampled and field screened using the HAZCAT field testing kit. Using GPS coordinates pre-selected for this investigation, locations were selected for the collection of surface soil samples (see Figure 2). All soil samples were field screened with the use of a Niton XRF Unit and an EnSys PCB Immunoassay Kit. After field screening, soil samples were selected by SAT personnel for laboratory analysis. No drum samples were sent for analysis. A white solid substance, located on soils throughout the site, was also collected and screened with the HAZCAT kit and the XRF Unit. CLP sample management included entering information into the FORMS 2 Lite Sample Tracking Program.

3. **Laboratories Receiving Samples:**

<u>Sample Type</u>	<u>Name/Address of Laboratory</u>	<u>Parameters</u>
Soil	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands, TX 77380	Pesticides/PCBs
Soil	Ceimic Corporation 10 Dean Knauss Drive Narragansett, RI 02882	TAL Metals

4. **Sample Dispatch Data:** Twenty (20) soil samples were shipped via Federal Express airbill No. 851847483114 to A4 Scientific for CLP TCL Pesticides/PCBs analysis on April 29, 2005 by RST. Twenty (20) soil samples were also shipped via Federal Express airbill No. 815280597942 to Ceimic Corporation for CLP TAL Metals analysis on April 29, 2005 by RST. All sample information was entered electronically into the FORMS 2 Lite Sample Tracking Program. Chain of Custody Records and Shipping Documentation are included in Appendix A. Table 1 describes all samples collected.

5. **Personnel on Site:**

Name	Affiliation	Duties on-site
Nick Magriples	U.S. EPA-Region II	On-Scene Coordinator (OSC)
Aaron Levy	Region II-RST	RST Site Project Manager, Sample Management, Site QC Officer, Drum Inventory
Michael Mahnkopf	Region II-RST	Site Health and Safety Officer, Sampling, Drum Inventory, Field Screening
John Brennan	Region II-RST	Sample Management, Sampling
Frank Campbell	Region II-RST	Sampling, Inventory Support
Kristen Dobinson	U.S. EPA-Region II	Site Assessment Manager (SAM)
Michele Capriglione	Region II-SAT	SAT Site Manager, Site QA/QC, GPS
Heather Carson	Region II-SAT	XRF Field Screening
Kathleen Bigelow	Region II-SAT	PCB Field Screening
Jason Standowski	Region II-SAT	XRF Field Screening

6. **Additional Comments:** The following people were on site to initiate activities: Nick Magriples, the EPA OSC, Kristen Dobinson, the EPA SAM, RST and SAT. Personnel met in the morning of April 27, 2005 to review the project scope of work and site specific health and safety issues. The site OSC gave RST a tour of the drum area to be investigated, inventoried and sampled.

Sampling Activities:

A. Soil Sampling: A total of 82 surface (0-6") soil samples, including one field duplicate, were collected and field screened. Table 1 gives a description and the location of all soil samples. Dedicated aluminum sampling pans and plastic scoops were used for the soil sampling. After homogenization, samples were placed in 1-gallon plastic bags and transported to the field screening area. Based on field screening results, 20 samples were selected for laboratory confirmation analysis. All soils for analysis were transferred to clean sample bottles for shipment via Federal Express to their appropriate laboratory (see Table 2).

B. Drum Sampling: Drum screening was conducted using field-screening instruments (Multi-RAE, Ludlum Model 19, and Micro-FID). Air monitoring readings in the area surrounding the drums indicated no immediate hazard. All readings were at background levels. Four of the five drums investigated were empty. One sample was collected for field screening from Drum Number 001. Field screening indicated that the material in the drum was not a hazard (see Table 3) and therefore, was not sent for analysis (Appendix B contains Drum Inventory and Field Testing Logs).

C. White Powder/Solid Sampling: One composite sample was collected of the white powder/solid, which was found coating the ground at several locations throughout the Site. Field screening results showed the material to be an inorganic, non-metallic solid. The OSC took the sample to the Environmental Response Team (ERT) laboratory for identification.

7. **Weather Conditions:** The weather conditions were warm and pleasant with temperatures in the mid-50 to 60's.


8. **Report Prepared by:**



Aaron Levy
Group Leader/Site Project Manager

5/6/05
Date

Report Reviewed by:



John Brennan
Group Leader

5/6/04
Date

TABLE 1 - SAMPLING SUMMARY

MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

Page 1 of 11

Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
MIM-SO-001	B1ZT0	MB1ZT0	S22 S12	04/27/05 1220 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-002	B1ZT1	MB1ZT1	OS-S12	04/27/05 1515 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-003	B1ZT2	MB1ZT2	OS-S02	04/27/05 1235 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-004	B1ZT3	MB1ZT3	B-S29	04/28/05 0822 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-005	B1ZT4	MB1ZT4	OS-S10	04/27/05 1550 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-006	B1ZT5	MB1ZT5	ROAD D	04/28/05 1100 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY
MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
MIM-SO-007	B1ZT6	MB1ZT6	PB12 S3	04/27/05 1447 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil MS/MSD
MIM-SO-008	B1ZT7	MB1ZT7	BKG S01	04/28/05 1237 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Background surface soil
MIM-SO-009	B1ZT8	MB1ZT8	BKG S02	04/28/05 1253 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Background surface soil
MIM-SO-010	B1ZT9	MB1ZT9	B-S29	04/28/05 1200 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Duplicate of MIM-SO-004
MIM-SO-011	B1ZW0	MB1ZW0	BKG S03	04/29/05 1053 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Background surface soil
MIM-SO-012	B1ZW1	MB1ZW1	B-S24	04/28/05 1533 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY

**MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005**

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
MIM-SO-013	B1ZW2	MB1ZW2	B-S25	04/28/05 1555 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-014	B1ZW3	MB1ZW3	TP-S10	04/29/05 0945 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-015	B1ZW4	MB1ZW4	B-S20	04/28/05 1522 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-016	B1ZW5	MB1ZW5	TP-S17	04/28/05 1710 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-017	B1ZW6	MB1ZW6	B-S27	04/28/05 1605 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-018	B1ZW7	MB1ZW7	TP-S05	04/29/05 0927 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY

**MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005**

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
MIM-SO-019	B1ZW8	MB1ZW8	TP-S03	04/29/05 1000 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
MIM-SO-020	B1ZW9	MB1ZW9	TP-S13	04/28/05 1740 hrs	0-6"	TAL Metals, Pesticides/PCBs Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S08	N/A	N/A	OS-S08	04/27/05 1210 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S01	N/A	N/A	OS-S01	04/27/05 1255 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
S35-N1	N/A	N/A	S35-N1	04/27/05 1155 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
S34-N3	N/A	N/A	S34-N3	04/27/05 1155 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S05	N/A	N/A	OS-S05	04/27/05 1226 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S14	N/A	N/A	OS-S14	04/27/05 1136 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY
MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
OS-S04	N/A	N/A	OS-S04	04/27/05 1225 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S11	N/A	N/A	OS-S11	04/27/05 1150 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S13	N/A	N/A	OS-S13	04/27/05 1530 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S07	N/A	N/A	OS-S07	04/27/05 1605 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S09	N/A	N/A	OS-S09	04/27/05 1450 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
S22-N15	N/A	N/A	S22-N15	04/27/05 1418 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
S28E1	N/A	N/A	S2E1	04/27/05 1435 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S03	N/A	N/A	OS-S03	04/27/05 1425 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
OS-S06	N/A	N/A	OS-S06	04/27/05 1442 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY
MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
B-S30	N/A	N/A	B-S30	04/28/05 0816 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S28	N/A	N/A	B-S28	04/28/05 0832 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S26	N/A	N/A	B-S26	04/28/05 0842 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S23	N/A	N/A	B-S23	04/28/05 0856 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
BIAS-1	N/A	N/A	BIAS-1	04/28/05 0905 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
BIAS-2	N/A	N/A	BIAS-2	04/28/05 0914 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S21	N/A	N/A	B-S21	04/28/05 0921 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S19	N/A	N/A	B-S19	04/28/05 0937 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S17	N/A	N/A	B-S17	04/28/05 0952 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY
MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
B-S15	N/A	N/A	B-S15	04/28/05 1000 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S13	N/A	N/A	B-S13	04/28/05 1012 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S11	N/A	N/A	B-S11	04/28/05 1018 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S10	N/A	N/A	B-S10	04/28/05 1027 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
BIAS-3	N/A	N/A	BIAS-3	04/28/05 1037 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S07	N/A	N/A	B-S07	04/28/05 1043 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
BIAS-4	N/A	N/A	BIAS-4	04/28/05 1050 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
BIAS-5	N/A	N/A	BIAS-5	04/28/05 1100 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
ROAD A	N/A	N/A	ROAD A	04/28/05 1035 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY

**MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005**

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
ROAD B	N/A	N/A	ROAD B	04/28/05 1040 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
ROAD C	N/A	N/A	ROAD C	04/28/05 1055 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S02	N/A	N/A	B-S02	04/28/05 1356 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S01	N/A	N/A	B-S01	04/28/05 1350 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S08	N/A	N/A	B-S08	04/28/05 1341 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S03	N/A	N/A	B-S03	04/28/05 1405 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S04	N/A	N/A	B-S04	04/28/05 1413 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S05	N/A	N/A	B-S05	04/28/05 1420 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S06	N/A	N/A	B-S06	04/28/05 1427 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY

**MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005**

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Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
TP-S01	N/A	N/A	TP-S01	04/28/05 1440 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S09	N/A	N/A	B-S09	04/28/05 1437 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S12	N/A	N/A	B-S12	04/28/05 1458 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S14	N/A	N/A	B-S14	04/28/05 1507 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S16	N/A	N/A	B-S16	04/28/05 1510 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S18	N/A	N/A	B-S18	04/28/05 1515 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S22	N/A	N/A	B-S22	04/28/05 1526 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S16	N/A	N/A	TP-S16	04/28/05 1715 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S12	N/A	N/A	TP-S12	04/28/05 1720 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY
MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

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Sample ID	CLP Organic No. -	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
TP-S11	N/A	N/A	TP-S11	04/28/05 1730 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
B-S31	N/A	N/A	B-S31	04/28/05 1640 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S14	N/A	N/A	TP-S14	04/28/05 1655 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S15	N/A	N/A	TP-S15	04/28/05 1705 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S02	N/A	N/A	TP-S02	04/29/05 1011 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S04	N/A	N/A	TP-S04	04/29/05 0920 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S06	N/A	N/A	TP-S06	04/29/05 0932 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S07	N/A	N/A	TP-S07	04/29/05 0911 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S08	N/A	N/A	TP-S08	04/29/05 0904 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

TABLE 1 - SAMPLING SUMMARY

MATTEO IRON & METAL SITE
WEST DEPTFORD TOWNSHIP, NEW JERSEY
APRIL 27, 28 & 29, 2005

Page 11 of 11

Sample ID	CLP Organic No.	CLP Inorganic No.	Location	Date/Time	Depth Interval	Analytical Parameters	Comments
TP-S18	N/A	N/A	TP-S18	04/29/05 0856 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil
TP-S09	N/A	N/A	TP-S09	04/29/05 0950 hrs	0-6"	Niton XRF Field Screen EnSys Immunoassay Field Screen	Surface soil

Note: N/A = Not Applicable

**TABLE 2 - ANALYTICAL PARAMETER
AND LABORATORY SUMMARY**

**MATTEO IRON & METAL SITE
WEST DEPTFORD, NEW JERSEY
APRIL 27, 28, & 29, 2005**

Page 1 of 2

RST Sample ID	CLP Organic No.	CLP Inorganic No.	Analytical Parameter	Laboratory
MIM-SO-001	B1ZT0	MB1ZT0	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-002	B1ZT1	MB1ZT1	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-003	B1ZT2	MB1ZT2	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-004	B1ZT3	MB1ZT3	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-005	B1ZT4	MB1ZT4	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-006	B1ZT5	MB1ZT5	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-007	B1ZT6	MB1ZT6	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-008	B1ZT7	MB1ZT7	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-009	B1ZT8	MB1ZT8	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-010	B1ZT9	MB1ZT9	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation

**TABLE 2 - ANALYTICAL PARAMETER
AND LABORATORY SUMMARY**

**MATTEO IRON & METAL SITE
WEST DEPTFORD, NEW JERSEY
APRIL 27, 28, & 29, 2005**

Page 2 of 2

RST Sample ID	CLP Organic No.	CLP Inorganic No.	Analytical Parameter	Laboratory
MIM-SO-011	B1ZW0	MB1ZW0	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-012	B1ZW1	MB1ZW1	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-013	B1ZW2	MB1ZW2	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-014	B1ZW3	MB1ZW3	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-015	B1ZW4	MB1ZW4	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-016	B1ZW5	MB1ZW5	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-017	B1ZW6	MB1ZW6	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-018	B1ZW7	MB1ZW7	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-019	B1ZW8	MB1ZW8	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation
MIM-SO-020	B1ZW9	MB1ZW9	Pesticide/PCB	A4 Scientific
			TAL Metals	Ceimic Corporation

TABLE 3 - DRUM/WASTE INVENTORY

**MATTEO IRON & METAL SITE
WEST DEPTFORD, NEW JERSEY
APRIL 27, 28, & 29, 2005**

DRUM/ SAMPLE ID	SIZE (gal.)	CONSTRUCTION	CONDITION	CONTENTS	FIELD TESTS/ RESULTS
001	55	steel	rusted, dented	1/3 full, light brown, aqueous liquid	air reactive - neg. water reactive - neg. hexane soluble - neg. water soluble - pos. pH = 7 oxidizer - neg. peroxide - neg. cyanide - neg. sulfide - neg. flammable - neg.
002	55	steel	rusted	empty	none
003	55	steel	rusted, dented	empty	none
004	55	steel	rusted, crushed	empty	none
005	55	steel	rusted, dented, perforated	empty	none
White Solid	N/A	N/A	on soils throughout site	white/brown, moist, powdery solid	air reactive - neg. water reactive - neg. hexane soluble - neg. water soluble - neg. pH = 6 oxidizer - neg. flammable - neg. hairpin char - neg. char ignition - neg. char oxidizer - neg. char pH = 6

N/A - Not Applicable

FIGURE 1

**Matteo Iron and Metal Site
West Deptford, New Jersey
Site Location Map**

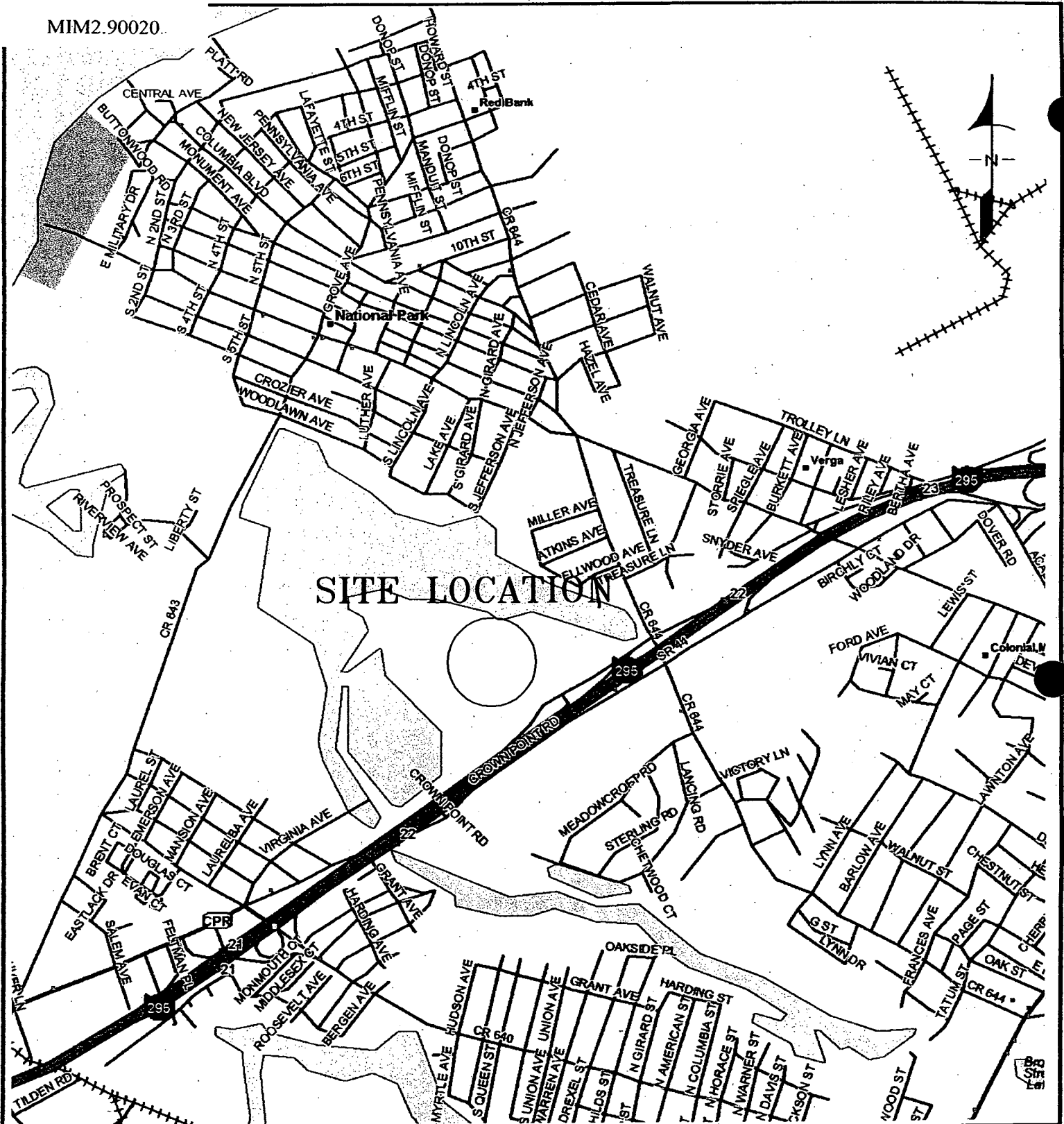


FIGURE 1
SITE LOCATION MAP
MATTEO IRON AND METAL SITE
WEST DEPTFORD, NJ

US ENVIRONMENTAL PROTECTION AGENCY
 REMOVAL SUPPORT TEAM
 CONTRACT # 68-W-00-113

EDITED BY: V. HENSCHER

EPA OSC: N. MAGRIPLES

SITE PROJECT MANAGER: A. LEVY

FILE: D:\DWG\MATTEO



Weston Solutions Inc.
FEDERAL PROGRAMS DIVISION

IN ASSOCIATION WITH SCIENTIFIC ENVIRONMENTAL ASSOCIATES, INC.
 TERRACORP INC.
 AND INNOVATIVE TECHNOLOGICAL SOLUTIONS INC.

FIGURE 2

**Matteo Iron and Metal Site
West Deptford, New Jersey
April 27, 28, 29, 2005
Sample Location Map**

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APPENDIX A

Matteo Iron and Metal Site
West Deptford, New Jersey
April 27, 28, 29, 2005
Chain of Custody Records
Sample Shipping Records



USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 34156

DAS No:

SDG No:

L

MIM2.90024

Date Shipped: 4/29/2005 Carrier Name: FedEx Airbill: 815280597942 Shipped to: Celmic Corporation 10 Dean Knauss Drive Narragansett RI 02882 (401) 782-8900	Chain of Custody Record		Sampler Signature:	For Lab Use Only Lab Contract No: _____ Unit Price: _____ Transfer To: _____ Lab Contract No: _____ Unit Price: _____	
	Relinquished By	(Date / Time)	Received By		(Date / Time)
	1	<i>Aaron Levy</i> 4/29/05 / 1530			
	2				
	3				
4					

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	FOR LAB USE ONLY Sample Condition On Receipt
MB1ZT0	Soil/Sediment/ Aaron Levy	L/G	TM (14)	(Ice Only) (1)	001	S: 4/27/2005	12:20	B1ZT0	
MB1ZT1	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	002	S: 4/27/2005	15:15	B1ZT1	
MB1ZT2	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	003	S: 4/27/2005	12:35	B1ZT2	
MB1ZT3	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	004	S: 4/28/2005	8:22	B1ZT3	
MB1ZT4	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	005	S: 4/27/2005	15:50	B1ZT4	
MB1ZT5	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	006	S: 4/28/2005	11:00	B1ZT5	
MB1ZT6	Soil/Sediment/ Aaron Levy	L/G	TM (14)	(Ice Only), 1 (Ice Only) (3)	007	S: 4/27/2005	14:47	B1ZT6	
MB1ZT7	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	008	S: 4/28/2005	12:37	B1ZT7	
MB1ZT8	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	009	S: 4/28/2005	12:53	B1ZT8	
MB1ZT9	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0010	S: 4/28/2005	12:00	B1ZT9	

Shipment for Case Complete? <input checked="" type="checkbox"/>	Sample(s) to be used for laboratory QC: MB1ZT6	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key: TM = CLP TAL Total Metals	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input checked="" type="checkbox"/>	Shipment Iced? <input checked="" type="checkbox"/>

TR Number: 2-205957391-042905-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
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F2V5.1.043 Page 1 of 2



EPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 34156
DAS No:
SDG No:

L

Date Shipped: 4/28/2005 Carrier Name: FedEx Airbill: 815280597942 Shipped to: Ceimic Corporation 10 Dean Knauss Drive Narragansett RI 02882 (401) 782-8900	Chain of Custody Record		Sampler Signature:	
	Relinquished By	(Date / Time)	Received By	(Date / Time)
	1 <i>Aaron Levy</i>	4/29/05 / 1530		
	2			
	3			
4				
For Lab Use Only				
Lab Contract No: _____				
Unit Price: _____				
Transfer To: _____				
Lab Contract No: _____				
Unit Price: _____				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	FOR LAB USE ONLY Sample Condition On Receipt
MB1ZW0	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0011	S: 4/29/2005	10:53	B1ZW0	
MB1ZW1	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0012	S: 4/28/2005	15:33	B1ZW1	
MB1ZW2	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0013	S: 4/28/2005	15:55	B1ZW2	
MB1ZW3	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0014	S: 4/29/2005	9:45	B1ZW3	
MB1ZW4	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0015	S: 4/28/2005	15:22	B1ZW4	
MB1ZW5	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0016	S: 4/28/2005	17:10	B1ZW5	
MB1ZW6	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0017	S: 4/28/2005	16:05	B1ZW6	
MB1ZW7	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0018	S: 4/29/2005	9:27	B1ZW7	
MB1ZW8	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0019	S: 4/29/2005	10:00	B1ZW8	
MB1ZW9	Soil/Sediment/ Aaron Levy	L/G	TM (14)	1 (Ice Only) (1)	0020	S: 4/28/2005	17:40	B1ZW9	

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MB1ZT6	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key: TM = CLP TAL Total Metals	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>

TR Number: 2-205957391-042905-0001

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**USEPA Contract Laboratory Program
Organic Traffic Report & Chain of Custody Record**

Case No: 34156

DAS No:

SDG No:

L

MIM2.90026

Date Shipped: 4/29/2005 Carrier Name: FedEx Airbill: 851847483114 Shipped to: A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	Chain of Custody Record		Sampler Signature:	For Lab Use Only Lab Contract No: _____ Unit Price: _____ Transfer To: _____ Lab Contract No: _____ Unit Price: _____	
	Relinquished By	(Date / Time)	Received By		(Date / Time)
	1 <i>Aaron Levy</i>	4/29/05/1530			
	2				
	3				
4					

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		INORGANIC SAMPLE No.	FOR LAB USE ONLY Sample Condition On Receipt
B1ZT0	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	(Ice Only) (1)	001	S: 4/27/2005	12:20	MB1ZT0	
B1ZT1	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	002	S: 4/27/2005	15:15	MB1ZT1	
B1ZT2	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	003	S: 4/27/2005	12:35	MB1ZT2	
B1ZT3	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	004	S: 4/28/2005	8:22	MB1ZT3	
B1ZT4	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	005	S: 4/27/2005	15:50	MB1ZT4	
B1ZT5	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	006	S: 4/28/2005	11:00	MB1ZT5	
B1ZT6	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	(Ice Only), 1 (Ice Only) (3)	007	S: 4/27/2005	14:47	MB1ZT6	
B1ZT7	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	008	S: 4/28/2005	12:37	MB1ZT7	
B1ZT8	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	009	S: 4/28/2005	12:53	MB1ZT8	
B1ZT9	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0010	S: 4/28/2005	12:00	MB1ZT9	

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: B1ZT6	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key: PEST = CLP TCL Pesticide/PCBs	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G		Custody Seal Intact? <input type="checkbox"/> Shipment Iced? <input type="checkbox"/>

TR Number: 2-205957391-042905-0002

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EPA Contract Laboratory Program
Organic Traffic Report & Chain of Custody Record

Case No: 34156

DAS No:

SDG No:

L

Date Shipped: 4/29/2005 Carrier Name: FedEx Airbill: 851847483114 Shipped to: A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	Chain of Custody Record	Sampler Signature:	For Lab Use Only Lab Contract No: _____ Unit Price: _____ Transfer To: _____ Lab Contract No: _____ Unit Price: _____
	Relinquished By (Date / Time)	Received By (Date / Time)	
	1 <i>Aaron Levy</i> 04/29/05/1530		
	2		
	3		
4			

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		INORGANIC SAMPLE No.	FOR LAB USE ONLY Sample Condition On Receipt
B1ZW0	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0011	S: 4/29/2005	10:53	MB1ZW0	
B1ZW1	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0012	S: 4/28/2005	15:33	MB1ZW1	
B1ZW2	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0013	S: 4/28/2005	15:55	MB1ZW2	
B1ZW3	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0014	S: 4/29/2005	9:45	MB1ZW3	
B1ZW4	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0015	S: 4/28/2005	15:22	MB1ZW4	
B1ZW5	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0016	S: 4/28/2005	17:10	MB1ZW5	
B1ZW6	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0017	S: 4/28/2005	16:05	MB1ZW6	
B1ZW7	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0018	S: 4/29/2005	9:27	MB1ZW7	
B1ZW8	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0019	S: 4/29/2005	10:00	MB1ZW8	
B1ZW9	Soil/Sediment/ Aaron Levy	L/G	PEST (14)	1 (Ice Only) (1)	0020	S: 4/28/2005	17:40	MB1ZW9	

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: B1ZT6	Additional Sampler Signature(s):	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key: PEST = CLP TCL Pesticide/PCBs	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>

TR Number: 2-205957391-042905-0002

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
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MIM2.90028

FedEx USA Airbill

FedEx
Tracking
Number

851847483114

From Please print and press hard
Date 4-29-05 **Sender's FedEx Account Number**

Sender's Name JOHN BRENNAN **Phone** (732) 225-6116

Company WESTON SOLUTIONS, INC.

Address 1090 KING GEORGES POST ROAD
 City EDISON State NJ ZIP 08837

Your Internal Billing Reference 203010010020402

To
Recipient's Name SCIENTIFIC **Phone** (281) 292-5277
Company RECEIVING

Recipient's Address 1544 SAWDUST ROAD 505
 City THE WOODLANDS State TX ZIP 77380

Address

To request a package be held at a specific FedEx location, print FedEx address here.

Try online shipping at fedex.com

By using this Airbill you agree to the service conditions on the back of this Airbill and in our current Service Guide, including terms that limit our liability.

Questions? Visit our Web site at www.fedex.com or call 1.800.GoFedEx 1.800.463.3339.

0200 **Sender's Copy**

4a Express Package Service

☒ FedEx Priority Overnight Next business morning* ☐ FedEx Standard Overnight Next business afternoon* ☐ FedEx First Overnight Earliest next business morning delivery to select locations*

☐ FedEx 2Day Second business day* ☐ FedEx Express Saver Third business day*

* FedEx Envelope rate not available. Minimum charge: One-pound rate

4b Express Freight Service

☐ FedEx 1Day Freight* Next business day* ☐ FedEx 2Day Freight Second business day* ☐ FedEx 3Day Freight Third business day*

* Call for Confirmation

5 Packaging

☐ FedEx Envelope* ☐ FedEx Pak* Includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak ☐ FedEx Box ☐ FedEx Tube ☒ Other

6 Special Handling

☒ SATURDAY Delivery Available ONLY for FedEx Priority Overnight, FedEx 2Day, FedEx 1Day Freight, and FedEx 2Day Freight to select ZIP codes ☐ HOLD Weekday at FedEx Location NOT Available for FedEx First Overnight ☐ HOLD Saturday at FedEx Location Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations

Include FedEx address in Section 3

Does this shipment contain dangerous goods? One box must be checked.

☒ No ☐ Yes As per attached Shipper's Declaration ☐ Yes Shipper's Declaration not required ☐ Dry Ice Dry Ice 3 UN 1845 ☐ Cargo Aircraft Only

Dangerous goods (including Dry Ice) cannot be shipped in FedEx packaging.

7 Payment Bill to: Enter FedEx Acct. No. or Credit Card No. below.

☐ Sender Acct. No. in Section 1 will be billed. ☐ Recipient ☒ Third Party ☐ Credit Card ☐ Cash/Check

FedEx Acct. No. 154581227 Exp. Date

Total Packages 1 **Total Weight** 4.0 **Total Declared Value*** \$.00

* Our liability is limited to \$100 unless you declare a higher value. See back for details.

8 Sign to Authorize Delivery Without a Signature

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.

467

Rev. Date 11/03 • Part #58281 • ©1994-2003 FedEx • PRINTED IN U.S.A. MWA 04

FedEx USA Airbill

FedEx
Tracking
Number

815280597942

From Please print and press hard
Date 4-29-05 **Sender's FedEx Account Number**

Sender's Name JOHN BRENNAN **Phone** (732) 225-6116

Company WESTON SOLUTIONS, INC.

Address 1090 KING GEORGES POST ROAD
 City EDISON State NJ ZIP 08837

Your Internal Billing Reference 203010010020402

To
Recipient's Name RECEIVING **Phone** (401) 782-8700

Company CEIMIC LAB

Address 10 DEAN KNAUSS DRIVE
 City NARRAGANSETT State RI ZIP 02882

Address

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Questions? Call 1-800-Go-FedEx® (800-463-3339)
 Visit our Web site at www.fedex.com

By using this Airbill you agree to the service conditions on the back of this Airbill and in our current Service Guide, including terms that limit our liability.

0200 **Sender's Copy**

4a Express Package Service

☒ FedEx Priority Overnight Next business morning* ☐ FedEx Standard Overnight Next business afternoon* ☐ FedEx First Overnight Earliest next business morning delivery to select locations*

☐ FedEx 2Day Second business day* ☐ FedEx Express Saver Third business day*

* FedEx Envelope rate not available. Minimum charge: One-pound rate

4b Express Freight Service

☐ FedEx 1Day Freight* Next business day* ☐ FedEx 2Day Freight Second business day* ☐ FedEx 3Day Freight Third business day*

* Call for Confirmation

5 Packaging

☐ FedEx Letter* ☐ FedEx Pak* ☒ Other Pkg. Includes FedEx Box, FedEx Tube, and customer pkg.

6 Special Handling

☒ Saturday Delivery Available for FedEx Priority Overnight and FedEx 2Day to select ZIP codes ☐ HOLD Weekday at FedEx Location Not available with FedEx First Overnight ☐ HOLD Saturday at FedEx Location Available for FedEx Priority Overnight and FedEx 2Day to select locations

Include FedEx address in Section 3

Does this shipment contain dangerous goods? One box must be checked.

☒ No ☐ Yes As per attached Shipper's Declaration ☐ Yes Shipper's Declaration not required ☐ Dry Ice Dry Ice 3 UN 1845 ☐ Cargo Aircraft Only

Dangerous Goods cannot be shipped in FedEx packaging.

7 Payment Bill to: Enter FedEx Acct. No. or Credit Card No. below.

☐ Sender Acct. No. in Section 1 will be billed. ☐ Recipient ☒ Third Party ☐ Credit Card ☐ Cash/Check

FedEx Acct. No. 154581227 Exp. Date

Total Packages 1 **Total Weight** 4.0 **Total Declared Value*** \$.00

* Our liability is limited to \$100 unless you declare a higher value. See back for details.

8 Release Signature Sign to authorize delivery without obtaining signature.

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.

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APPENDIX B

Matteo Iron and Metal Site
West Deptford, New Jersey
April 27, 28, 29, 2005
Drum Inventory and Field Testing Logs

DRUM INVENTORY & FIELD TESTING LOG

SITE NAME: MATED SAMPLE #: 001 DRUM NUMBER: 001
 LOGGER: mm/AL SAMPLER: mm DATE/TIME: 4/27/05 / 0955

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION	
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusted <input checked="" type="checkbox"/>	leaking <input type="checkbox"/>
Steel <input checked="" type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	perforated <input type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input checked="" type="checkbox"/>		other _____	good <input type="checkbox"/>

DRUM SIZE (Gallons): 85 ☐ 55 ☒ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME _____

CHEMICAL NAME _____

DRUM MARKINGS _____

DRUM LABELS _____

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID 0 FID 0.6 RAD METER 5-6 ppm/h OTHER _____

PHYSICAL DESCRIPTION: drum = 1/3 full light brown aqueous liquid

Layers			Physical			Color/Description			Clarity			Solubility		Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W
H	N	I	O	L	E	Watery	Paste	Chunks	L	L	P	A	E	I	A
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	T	X	R	T
S	H	U	I	D		Soft	Hard	Powder	A	U	Q	E	A		E
E	E	I	D	G		Crystal	Granular	Rubbery	R	D	U	R	N		R
	S	D		E						Y	E		E		
Top	1/2"	X				light brown aqueous liq						+	-	-	-
Middle															
Bottom															

FIELD SCREENING RESULTS:

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top	7		—	—	—		—		—	
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

TEST COMPATIBILITY RESULTS:

Prepared by: M. Mahoney

Date: 4/27/05

DRUM INVENTORY & FIELD TESTING LOG

MIM2.90031

SITE NAME: MATED SAMPLE #: _____ DRUM NUMBER: 002
 LOGGER: mm AL SAMPLER: _____ DATE/TIME: 4/27/05

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION	
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusted <input checked="" type="checkbox"/>	leaking <input type="checkbox"/> dented <input type="checkbox"/>
Steel <input checked="" type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	perforated <input type="checkbox"/> good <input type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input checked="" type="checkbox"/>		other _____	

DRUM SIZE (Gallons): 85 ☐ 55 ☒ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME _____

CHEMICAL NAME _____

DRUM MARKINGS _____

DRUM LABELS _____

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID 0 FID 0.6 RAD METER 5-6 v/h OTHER _____

PHYSICAL DESCRIPTION: m/T

Layers			Physical			Color/Description			Clarity			Solubility		Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W
H	N	I	O	L	E	Watery	Paste	Chunks,	L	L	P	A	E	I	A
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	T	X	R	T
S	H	U	I	D		Soft	Hard	Powder	A	U	Q	E	A		E
E	E	I	D	G		Crystal	Granular	Rubbery	R	D	E	R	N		R
	S	D		E						Y			E		
Top															
Middle															
Bottom															

FIELD SCREENING RESULTS:

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top										
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

TEST COMPATIBILITY RESULTS:

Prepared by: _____

Date: _____

MIM2.90032

DRUM INVENTORY & FIELD TESTING LOG

SITE NAME: MATED SAMPLE #: _____ DRUM NUMBER: 003
 LOGGER: _____ SAMPLER: _____ DATE/TIME: 4/27/05

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION	
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusty <input checked="" type="checkbox"/>	leaking <input type="checkbox"/>
Steel <input checked="" type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	dented <input checked="" type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input checked="" type="checkbox"/>		perforated <input type="checkbox"/>	good <input type="checkbox"/>
other _____					

DRUM SIZE (Gallons): 85 ☐ 55 ☒ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME _____

CHEMICAL NAME _____

DRUM MARKINGS _____

DRUM LABELS _____

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID φ FID 0.6 RAD METER 5-6 uR/hr OTHER _____

PHYSICAL DESCRIPTION:

Layers			Physical			Color/Description			Clarity			Solubility		Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W
H	N	I	O	L	E	Watery	Paste	Chunks	L	L	P	A	E	I	A
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	T	X	R	T
S	H	U	I	D		Soft	Hard	Powder	A	U	Q	E	A		E
E	E	I	D	G		Crystal	Granular	Rubbery	R	D	U	R	N		R
	S	D	E						Y	E	E		E		
Top															
Middle															
Bottom															

FIELD SCREENING RESULTS:

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top										
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

--

TEST COMPATIBILITY RESULTS:

--

Prepared by: _____

Date: _____

DRUM INVENTORY & FIELD TESTING LOG

MIM2.90033

SITE NAME: MATED SAMPLE #: _____ DRUM NUMBER: 004
 LOGGER: MM/AL SAMPLER: _____ DATE/TIME: 4/27/05

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION	
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusted <input checked="" type="checkbox"/>	leaking <input type="checkbox"/>
Steel <input checked="" type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	perforated <input type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input checked="" type="checkbox"/>		other <u>CRUSHED</u>	good <input type="checkbox"/>

DRUM SIZE (Gallons): 85 ☐ 55 ☒ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME _____

CHEMICAL NAME _____

DRUM MARKINGS Rotella - 15W-40 WITH XLA

DRUM LABELS _____

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID _____ FID _____ RAD METER _____ OTHER _____

PHYSICAL DESCRIPTION:

CRUSHED / MT

Layers			Physical			Color/Description			Clarity			Solubility		Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W
H	N	I	O	L	E	Watery	Paste	Chunks,	L	L	P	A	E	I	A
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	T	X	R	T
S	H	U	I	D		Soft	Hard	Powder	A	U	Q	E	A		E
E	E	I	D	G		Crystal	Granular	Rubbery	R	D	U	R	N		R
	S	D		E						Y	E		E		
Top															
Middle															
Bottom															

FIELD SCREENING RESULTS:

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top										
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

TEST COMPATIBILITY RESULTS:

Prepared by: _____

Date: _____

MIM2.90034

DRUM INVENTORY & FIELD TESTING LOG

SITE NAME: MATED SAMPLE #: _____ DRUM NUMBER: 005
 LOGGER: mm/AL SAMPLER: _____ DATE/TIME: 4/27/05

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION	
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusted <input checked="" type="checkbox"/>	leaking <input type="checkbox"/>
Steel <input checked="" type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	perforated <input checked="" type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input checked="" type="checkbox"/>		other _____	good <input type="checkbox"/>

DRUM SIZE (Gallons): 85 ☐ 55 ☒ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME _____

CHEMICAL NAME _____

DRUM MARKINGS _____

DRUM LABELS _____

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID 0 FID 0.6 RAD METER 5-6 OTHER _____

PHYSICAL DESCRIPTION: M/T hole in drum

Layers			Physical			Color/Description			Clarity			Solubility			Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W	
H	N	I	O	L	E	Watery	Paste	Chunks	L	L	P	A	E	I	A	
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	T	X	R	T	
S	H	U	I	D		Soft	Hard	Powder	A	U	Q	E	A		E	
E	E	J	D	G		Crystal	Granular	Rubbery	R	D	U	R	N		R	
	S	D	E						Y	E		E				
Top																
Middle																
Bottom																

FIELD SCREENING RESULTS:

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top										
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

--

TEST COMPATIBILITY RESULTS:

--

Prepared by: _____

Date: _____

DRUM INVENTORY & FIELD TESTING LOG

MIM2.90035

SITE NAME: Mates SAMPLE #: Powdery Solid DRUM NUMBER: N/A
 LOGGER: mm SAMPLER: AL DATE/TIME: 4/27/05 1220

DRUM DESCRIPTION:

CONSTRUCTION		TYPE		CONDITION	
Fiber <input type="checkbox"/>	Poly <input type="checkbox"/>	Poly Lined <input type="checkbox"/>	"Overpack" <input type="checkbox"/>	rusted <input type="checkbox"/>	leaking <input type="checkbox"/> dented <input type="checkbox"/>
Steel <input type="checkbox"/>	Nickel <input type="checkbox"/>	Open Top <input type="checkbox"/>	Ring Top <input type="checkbox"/>	bulging <input type="checkbox"/>	perforated <input type="checkbox"/> good <input type="checkbox"/>
Stainless Steel <input type="checkbox"/>	Other <input type="checkbox"/>	Closed Top <input type="checkbox"/>		other _____	

DRUM SIZE (Gallons): 85 ☐ 55 ☐ 42 ☐ 30 ☐ 15 ☐ 10 ☐ 5 ☐ Other _____

MFG NAME Hampin Chem - does not burn

CHEMICAL NAME Chem. Isotone - non-igniting steam = H₂O

DRUM MARKINGS Chem. Oxidizer - neg

DRUM LABELS Chem pH = 6

FIELD AIR MONITORING INSTRUMENT READINGS: MultiRAE _____ PID _____ FID _____ RAD METER _____ OTHER _____

PHYSICAL DESCRIPTION: White / brown moist powdery solid

Layers			Physical			Color/Description			Clarity			Solubility		Reaction	
P	I	L	S	S	G	Oil	Syrup	Viscous,	C	C	O	W	H	A	W
H	N	I	O	L	E	Watery	Paste	Chunks	L	L	P	A	E	I	A
A	C	Q	L	U	L	Gel	Spongy	Soap-like	E	O	A	T	X	R	T
S	H	U	I	D		Soft	Hard	<u>Powder</u>	A	U	Q	E	A		E
E	E	I	D	G		Crystal	Granular	Rubbery	R	D	U	R	N		R
	S	D		E						Y	E		E		
Top			X			white/brown moist						—	—	—	—
Middle						powdery solid									
Bottom															

FIELD SCREENING RESULTS: * Combustible Burns w/ flame. DOES NOT burn when mm flame is removed

Layers	pH	Chlorine Hot Wire	Flammable	Cyanide	Oxidizer	Chloride	Peroxide	Mercury	Sulfide	PCB
Top	6		mm* —		—					
Middle										
Bottom										

ASSIGNED WASTE STREAM - BASED ON INITIAL RCRA HAZARD

TEST COMPATIBILITY RESULTS:

Prepared by: _____

Date: _____

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FINAL REMEDIAL INVESTIGATION REPORT

Remedial Investigation and Remedial Action Selection Evaluations

Term Contract Number A-85149

Matteo Iron and Metal
West Deptford, New Jersey

Submitted to:



STATE OF NEW JERSEY
Department of Environmental Protection
401 East State Street,
Trenton, New Jersey

Submitted by:



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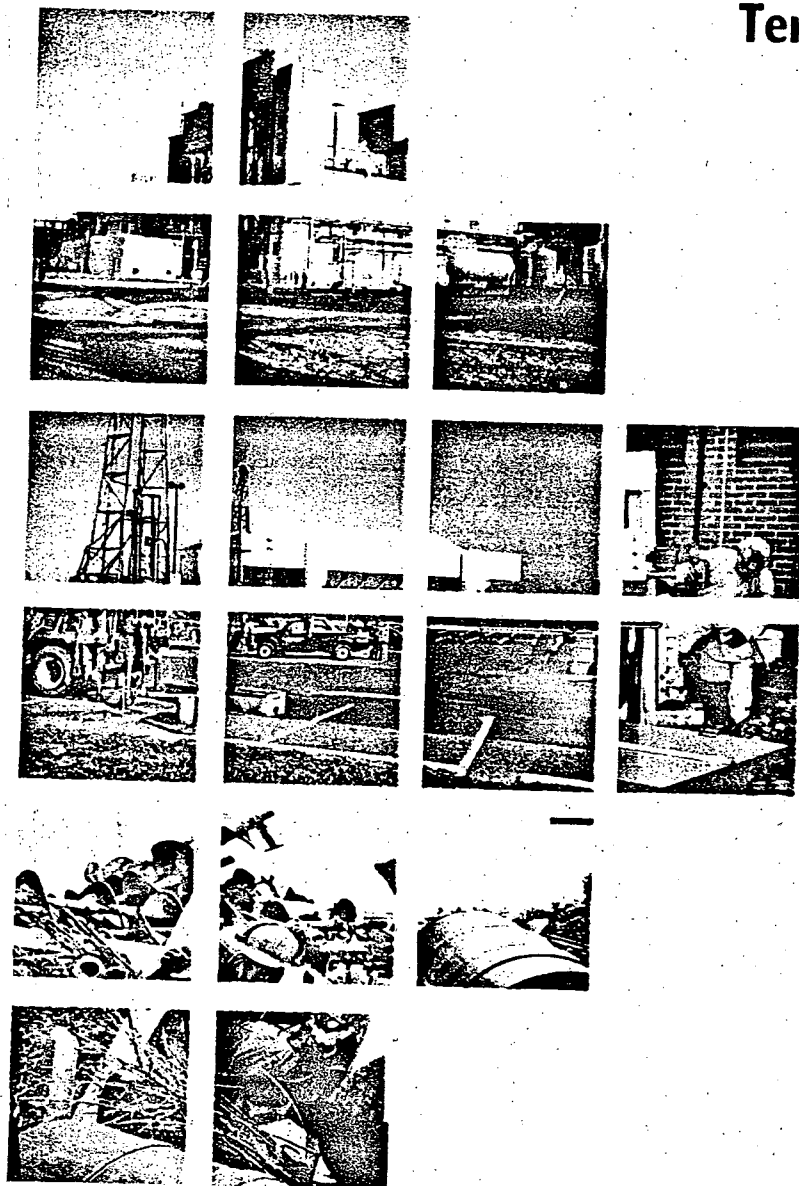


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1.0 INTRODUCTION

1.0 INTRODUCTION

The Louis Berger Group, Inc. (Berger) has prepared this Final Remedial Investigation Report (RIR) on behalf of the New Jersey Department of Environmental Protection (NJDEP) to document the findings of a Remedial Investigation (RI) conducted at the Matteo Iron and Metal facility (Matteo) located in the Township of West Deptford, Gloucester County (Figure 1-1). The Matteo RI was completed by Berger as part of a state-wide contract with the NJDEP to perform site specific Remedial Investigations and Remedial Action Selection Evaluations (RI/RASE) at multiple sites throughout the state.

The Matteo RI was initiated in response to the observed disposal of crushed automotive battery casings in an area of wetlands adjacent to the Site by NJDEP personnel. The disposal of battery casings was reportedly performed in conjunction with a former lead melting operation that was performed at the Site from 1971 until 1985. As part of the RI program for the Matteo Site, Berger initially prepared the *Site Sampling and Investigation Plan* (SSIP) (Berger, September 1999). Based on the results of a document review and site visit, several data gaps from previous site investigations were identified in the SSIP, and recommendations for further remedial investigation(s) were presented. The RI was implemented in accordance with the SSIP to provide the data needed to fulfill the following primary objectives:

- Define the nature and extent of the crushed battery casings disposed of along Woodbury Creek and Hessian Run.
- Delineate the extent of previously identified PCB soil contamination.
- Determine the impact of the Site conditions on adjacent surface waters and sediments.
- Determine the Site-specific subsurface stratigraphy.
- Determine the flow direction and quality of the shallow and deep groundwater regimes beneath the Site.
- Determine whether potable wells adjacent to the Site have been impacted by Site conditions.
- Establish topographic and boundary surveys for the Site.
- Determine the boundaries and extents of all wetlands on, and adjacent to the Site.

This report provides a background summary of the Site's history including previous investigations, a discussion of the investigative activities which were performed under the SSIP and the Additional Soil Delineation and Groundwater Sampling Plan (SGSP) (Berger, February 2002) and any deviations from these plans, a presentation of the findings from those investigative activities, and conclusions and recommendations based on those findings.

2.0 BACKGROUND

2.0 BACKGROUND

The Matteo Iron and Metal Site had historically been a farm, and is currently used as a scrap metal recycling facility. The southeastern portion of the Site (approximately 5-acres) is largely paved with asphalt, and contains several buildings which support the scrap metal recycling business. The remainder of the Site (approximately 75-acres) is comprised predominantly of heavily vegetated undeveloped land which borders Woodbury Creek to the west, Hessian Run to the north, and a residential trailer park to the south. Additionally, two utility lines (Colonial Oil and PSE&G) are located on the Northwestern portion of the property. A Site Plan showing these features is attached as Figure 2-1.

2.1 SITE HISTORY

Matteo Iron and Metal is located on an 80-acre site at 1708 U.S. Highway 130 in West Deptford, Gloucester County. According to public records, between 1907 and 1947, the Site was owned by Samuel and Bertha Wilkins who used a portion of the property for farming activities, while the remainder of the Site remained covered by woodlands. The Matteo family acquired the property in 1947. According to available records, the Matteo Family, under various names (James Matteo and Sons, Inc., Matteo Trucking Company, Thorofare Trucking and Trash Company, and Matteo Iron and Metal) has operated an unregistered landfill and junkyard, and a metals recycling facility at the Site since 1961. In 1968 the NJDEP identified an inactive incinerator at the Site. In 1971, the NJDEP approved Matteo's request to operate the incinerator to burn copper wire and Matteo submitted a plan to operate a "sweating fire box" to melt lead battery terminals for lead reclamation. This lead melting operation continued until 1985. In 1972, the NJDEP observed landfilling of crushed battery casings in an area of wetlands adjacent to Hessian Run. This operation was apparently performed in conjunction with the lead melting operation, as there were several reports of battery casing incineration and subsequent on-site ash disposal. In addition to the incineration and landfilling operations, drums of waste had also been identified as scattered throughout the property. In January of 1984, the NJDEP issued an Administrative Consent Order (ACO) to Matteo Iron and Metal for solid waste violations and required Matteo to cease waste disposal at the Site. The Matteo Property, which is mostly wooded, is currently comprised of a metals recycling operation, a junkyard, and an inactive landfill.

Historical aerial photographs for the years 1940, 1944, 1951, 1959, 1965, and 1975 were reviewed and are presented in Appendix A. The 1940 and 1944 aerial photographs show the property use to be primarily farmland. The 1951 aerial photograph shows a junkyard operation (scrap vehicles and associated structures) at the northeastern portion of the property, while the remaining property appears to still be farmland with associated farm buildings. The 1959 aerial photograph shows the junkyard operation ongoing in the northeastern area (including a large pile of dark debris, possibly the battery casings), and the remainder of the property as farmland with associated structures. A small pond is observed in the north central portion of the Site, and some material that appears to be soil has been deposited into Hessian Run north of the farm buildings. The 1965 aerial photograph shows the junkyard operation ongoing in the northeastern area (including the large pile of dark debris) and the farmland and associated farm buildings on the remainder of the property. A large landfill area is observed in the north-central portion of the

property, extending into Hessian Run. Dark debris is observed in Hessian Run north of the farm buildings where the apparent soil material was observed in the 1959 photo. In the 1975 aerial photograph, the junkyard operation has changed in appearance. There are very few scrap vehicles present and a structure, that may be the incinerator, is observed with an area of light colored material adjacent to it. The piles of dark debris are no longer visible, but the shoreline has extended into Hessian Run along the northern boundary of the property. The farm fields are still present, with the exception of the large field in the northwestern portion of the Site, which appears as an active disturbed area with light and dark (possibly stained) soil present.

2.2 PREVIOUS INVESTIGATIONS / REMEDIAL ACTIONS

Matteo, NJDEP, and the United States Environmental Protection Agency (USEPA) had all conducted limited investigations at the Site. The scopes of these investigations are discussed below. Lead had been found to be the primary contaminant of concern in the surface soils, surface waters, sediments, and groundwater at the Site. PCB contamination had also been identified in some of the surface soils and sediments. Additionally, a geophysical survey was conducted and test pits were excavated to investigate the nature and extent of the landfilled waste materials. Environmental investigations performed prior to this RI had been limited in scope, with no remedial action(s) either being proposed or implemented.

2.2.1 Responsible Party Investigations

Matteo, under the oversight of the NJDEP, conducted some limited sampling events including sampling of drums and other wastes at the Site, a geophysical investigation in the landfill area, excavating test pits, and collection of soil and aqueous samples from the test pits. Hazardous wastes were contained in a small number of the crushed drums and a widespread yellow substance that was observed, which was identified as having a high petroleum hydrocarbon content. Additionally, the wastes associated with the crushed battery casings exhibited hazardous levels of lead contamination, while Site soils exhibited widespread contamination with levels of petroleum and lead exceeding 1% of total volume.

2.2.2 NJDEP Investigations

Inspections of the Matteo Site by NJDEP documented the following actions:

- A "lead sweating operation".
- Landfilling of crushed automobile battery casings along the banks of Hessian Run.
- Unauthorized use of an incinerator for lead smelting operations.
- Ash from lead smelting operations hauled to on-site landfill.
- Two fires at the landfill.
- Discovery of abandoned drums of unknown waste.
- Discovery of a yellow waste dispersed across the Site.

These inspections led to several focused investigations of various media at the Site. These investigations revealed that, the on-site potable well had a concentration of lead exceeding the New Jersey Safe Drinking Water Act standard, elevated levels of lead and cadmium in soil

across the junkyard, and lead and cadmium exceeding NJDEP groundwater standards on a site-wide basis.

Additionally, in 1996 NJDEP Division of Publicly Funded Site Remediation performed a Preliminary Assessment/Site Investigation (PA/SI) for the Site (NJDEP, December 1996). The PA/SI was a comprehensive document that discussed past owners and Site operations; local soils and hydrogeology; sensitive environments; results of past sampling events for soil, groundwater, surface water and sediment; and historical remedial/enforcement actions.

2.2.3 USEPA Investigations

In June 1997 the USEPA conducted an Extent of Contamination (EOC) investigation which was limited to the "battery disposal area", in the vicinity of MW-5. The EOC consisted of the following activities:

- A ground-penetrating radar/electro-magnetic (GPR/EM) Survey to estimate quantity of battery casings along Hessian Run.
- Test pits to confirm the GPR/EM survey as well as collect soil samples for lead.
- Sediment samples in the marsh adjacent to the battery casing disposal area, in Hessian Run, and two drainage ditches that carried run-off from the Site to Hessian Run.
- Water samples from seeps, the battery casing disposal area and the adjacent marsh.
- Samples of the battery casings.

The results of these activities were:

- The volume of battery casings was estimated to be approximately 235,000 ft³.
- Overall lead concentrations in soil throughout the battery casing disposal area are on the order of 1,000 mg/kg.
- Sediment samples in the marsh areas had lead concentrations that ranged from the 1,000's mg/kg 10 feet from the shore line to the 100's mg/kg 50 feet from the shoreline.
- Sediment samples in Hessian Run had concentrations of lead that ranged from non-detect to 810 ppm.
- All seep water samples contained lead. (Weston, October 1997).

2.2.4 Remedial Investigation

No other remedial investigations or actions were conducted at the Matteo Site prior to this RI. Based on the information provided by the previously mentioned investigations, Berger conducted the field investigations associated with this RI between September 5, 2000 and October 23, 2002. The RI addressed the lead and PCB contamination identified during previous NJDEP investigations.

3.0 PHYSICAL SETTING

3.0 PHYSICAL SETTING

The Matteo Site is located at 1708 U.S. Highway 130 in West Deptford, Gloucester County, New Jersey. The Site occupies two tax parcels (Lot 2, Block 128 and Lot 2, Block 325) as identified on the West Deptford Township Tax Map. The property parcel consists of 80-acres of land located between the confluence of Woodbury Creek and Hessian Run to the west, Belmont Avenue to the east, and U.S. Highway 130 to the south. Figure 1-1 is an annotated USGS 7.5-minute quadrangle (Woodbury, NJ) showing the Site location, local topography, drainage and cultural features.

3.1 TOPOGRAPHY

The Matteo Site is located within the Coastal Plain Physiographic Province of NJ. This region is typically relatively flat, with an average elevation of approximately 10-feet above mean sea level (AMSL). The majority of the Site is unpaved, and heavily wooded, with a slight slope toward the west/northwest in the direction of Woodbury Creek and Hessian Run.

3.2 CLIMATE

A moderate range of temperatures characterizes the Matteo Site and surrounding areas. Average monthly temperatures range from a daily average in January of 26° F to a daily average in July of 76° F. The average annual precipitation is 44 inches, with most of the precipitation falling as rain. The highest monthly rainfall totals are typically recorded in July and August due to frequent thunderstorm activity. The prevailing wind direction during the winter months is from the northwest, whereas southwest winds prevail during the summer months (USDA, 1962).

3.3 SOIL

Within the Site there are five (5) soil mapping units as shown in the *Gloucester County Soil Survey* map (Figure 3-1). They include Downer loamy sand (DoB); Fallsington loam (Fd); Sassafras (SsE); Tidal Marsh (Tm); and Woodstown and Klej loamy sands (WtB). Brief descriptions of the soils found on the Site are presented below:

Downer Loamy Sand, 0-5 percent slopes - (DoB)

These moderately deep nearly level soils slope mildly and may range from 0 to 5 percent slopes in some areas. They have formed on sandy marine or stream sediments and are most common on the terraces of the Delaware River and in parts of the eastern half of the county. The ground water is normally well below a depth of 30 inches, however, in some areas it is higher during the winter months.

Fallsington loam - (Fd)

This soil type is found scattered through out the county and is formed in circular depressions and on flats adjacent to streams. The Fallsington soil is poorly drained and is usually wet almost to

the surface during the winter and spring. Surface soils are a dark-gray to very dark grayish color, and overlay a grayish brown to yellowish brown subsoil that is mottled. In most areas permeability is moderate to a depth of 30 inches. Permeability below a depth of 30 inches ranges from moderately rapid to slow.

Sassafras soils, 15-40 percent slopes - (SsE)

This well drained, soil unit is formed from sandy sediments that contain little or no glauconite. Sassafras soils are usually found in sandy flats along the Delaware River or within the gravelly soils on the higher divides. The slope ranges from steep to very steep, and on the steepest slopes there may be little or no soil development. Sassafras soils, which formed on steep slopes, are weakly developed and mainly consist of sand with little subsoil. In places where the soil is less sloping, the soils are strongly developed and have profiles closely resembling the normal Sassafras series.

Tidal Marsh - (Tm)

This mapped unit is near sea level and is inundated daily by tides. It occurs mainly along the Delaware River, but extends inland along tributaries. The upper three to ten feet is usually a mix of organic matter and mineral particles of mostly silt. The content of organic matter in the surface horizon ranges from high to very high, and in some places the material is peat. The soil is extremely acidic.

Woodstown and Klej - (WtB)

Woodstown soils are extensive and occur throughout most of the county. They are formed in areas that are nearly level and occur in the circular depressions that are common throughout the county. This soil consists of undifferentiated areas of Woodstown loamy sand and Klej loamy sand. During the winter, groundwater rises into the subsoil to about 2 feet from the surface and drops to a depth of about 4 feet in the summer. Permeability is moderate to a depth of 30 inches. Below 30 inches it ranges from slow to moderately rapid.

3.4 GEOLOGY

The regional geology is composed of Cretaceous and Quaternary age unconsolidated sediments. The Cretaceous sediments form a gently south-southeast dipping wedge of strata. The sediments are more than 2,500 feet thick along the coast and pinch to a thin horizon along the Fall Line. The Fall Line is a northwest-southeast trending contact where the coastal plain sediments unconformably onlap the Southern Piedmont Physiographic Province and Newark Basin. Generally, the coastal plain sediments strike northeast-southwest and dip to the south-southeast from 10 to 60 feet per mile. Overlying the Cretaceous sediments in some locations are mantles of Quaternary age deposits.

The Matteo Site is covered by a mantle of Quaternary age (Pleistocene) deposits of the Cape May formation (ref). Some Quaternary age (Holocene) alluvium may be present near the local streams. The Cape May Formation typically consists of yellow or brown medium to coarse

quartzose sand with some gravel and trace clay. The Cape May Formation is usually about 30 feet thick in the region.

Beneath this mantle of Quaternary deposits, the Site is underlain by the Upper Cretaceous age Merchantville and Magothy formations. According to the Geologic Map of New Jersey, Central Sheet (Owens, et al, 1995), the contact between the Merchantville and Magothy Formations runs through the Site (Figure 3-2). The southern and eastern portions of the Site are underlain by the Merchantville Formation and the northwestern portion of the Site is underlain by the Magothy Formation. In the region, the Merchantville Formation is composed of a black to green-black, glauconitic, micaceous clay, silty clay and sandy clay, and is typically 45 to 70 feet thick. Underlying the Merchantville, the Magothy Formation is of both continental and marine origin, and consists primarily of light colored, fine to coarse-grained beach sand with local beds of dark colored lignitic clay. The Magothy Formation, in the region, ranges in thickness between 150 and 500 feet. Underlying the Magothy, is the Raritan Formation that regionally ranges from 150 to over 500 feet thick. The Raritan consists chiefly of light colored sand and clay rich in hydrous aluminum silicates.

Based on subsurface information collected during this RI, two site-specific Geological Cross Sections were created (Figures 3-3 and 3-4). The Cape May Formation, which is generally observed at the Site as a brownish yellow sand, is approximately 15 feet thick at the eastern side of the Site and approximately 40 feet thick on the western side. There appears to have been historic erosion of the Upper Cretaceous surface in the direction of the Woodbury Creek and Hessian Run confluence. What is interpreted as alluvium is encountered near Hessian Run and is observed as a layer of peat and organic sediments underlain by approximately 15 feet of grayish green sand. In the eastern and southern portions of the Site, the Merchantville Formation is encountered beneath the Cape May formation and is generally observed as very dark gray clays and silts. The Merchantville is approximately 20 feet thick at the eastern and southern boundaries of the Site but is not present in the northwestern quarter of the property.

The Magothy formation underlies the above formations and extends at least to the full depth of the exploration of this RI (approximately 100 feet bgs). The Magothy Formation at the Site is generally observed as light gray sand with clay and silt lenses.

3.5 HYDROGEOLOGY

The main aquifer in the area consists primarily of the Upper Cretaceous Magothy and Raritan Formations of the Potomac-Raritan-Magothy aquifer. The Potomac-Raritan-Magothy aquifer system is described as a single hydrologic unit because over large areas they are indistinguishable and interconnected. The upper aquifer system of the Potomac-Raritan-Magothy system is reported to be at least 100 feet thick in the area of the Matteo Site. Regional groundwater data indicates groundwater flow to the southeast (NJDEP, December 1996).

The aquifer system in the vicinity of the Site is pumped heavily, especially in the summer months when groundwater is used for the irrigation of farms in the region. In addition to irrigation, heavy industrial and commercial demands are placed on the groundwater systems. As a result of continued pumping, water levels in the area have declined approximately 50 feet since

the mid-1960's. According to the USGS (USGS, 1995) groundwater levels have declined as much as 12 feet in the Gloucester County area between 1983 and 1988. During this same period a large, extensive cone-of-depression in the upper aquifers of the Potomac-Raritan-Magothy became apparent. The depression cone is centered in Camden and western Burlington Counties and extends throughout most of Gloucester County. According to Zepecza (1989), extreme pumping in this area has reversed the natural regional ground water flow. As a result, regional groundwater no longer discharges into the Delaware River; the river currently recharges the aquifer system.

The groundwater table was encountered at approximately 10 ft bgs across the Matteo Site. Consistent with the regional observations, the groundwater data collected during this RI indicates primary flow to the southeast. In addition to this horizontal gradient, a vertically downward gradient was also measured. These observations are consistent with the expected influence of inland pumping centers. The West Deptford Township withdrawal point (~100,000 gpd) is located 0.6 miles to the southeast. In addition to the general groundwater flow at the Site, a perched water table condition is observed on the Merchantville formation. The extent of this perched water table mirrors the extent of the Merchantville at the Site, which is primarily in the eastern and southern portions. In the extreme eastern portion of the Site, the perched water is observed to flow north to the Hessian Run. The remainder of the perched water flows towards the center of the Site where the Merchantville is not present and a direct connection between the sands of the Cape May formation and the sands of the Magothy formation is observed.

Tidal fluctuations were observed in the shallow (non-perched) and deep monitoring wells during this RI. In addition, the elevation of the Woodbury Creek was always observed higher than the groundwater in these shallow and deep wells, documenting not only the connection between the aquifer and the creek, but also the flow potential from the creek into the aquifer.

3.6 SURFACE WATER AND WETLANDS HABITATS

The Site is situated at the confluence of Woodbury Creek and Hessian Run, which are tidally influenced at this location. Tidal fluctuations range from approximately 6 feet at spring tides to approximately 5.4 feet at neap tide. Although the literature indicates that tidal currents are strong in the vicinity of Woodbury Creek and Hessian Run, there is no data reported on tidal current velocities (Trip Report, 1997). Both Woodbury Creek and Hessian Run are classified as (FW-2NT/SE2), waterways in which there may be a fresh water/salt water interface, as determined by salinity measurements at mean high tide (N.J.A.C. 7:9B-1.15(b) 6.x (1993)). RI average salinity measurements for the Woodbury Creek and Hessian Run during high and low tide are 0.01 (indicates fresh water). Hessian Run has a flow rate of 10 ft³/sec, while Woodbury Creek has a flow rate of 60 ft³/sec. Both waterways are used for fishing and recreation. The Delaware River is located 1.2 miles from the Site and has a flow rate of 2,000 ft³/sec.

The Site is situated in the Woodbury-Hessian Run marshes, which are fresh water tidal marshlands. The tidal marshes are flat and are regularly flooded by slightly brackish tides. They provide habitats for muskrat, ducks, and geese. These areas have been identified by the Atlantic Coast Ecological Inventory as part of the Delaware River Estuary. The sensitive

environments within one mile of the Site include Riverine Emergent, Palustrine Scrub-Shrub Emergent Deciduous, Palustrine Emergent Tidal and Palustrine Scrub-Shrub.

Also, the Atlantic Coast Ecological Inventory documents this area as part of the Delaware River Estuary, which contains game fish such as the American Shad and the Striped Bass (NJDEP, December 1996).

4.0 TECHNICAL OVERVIEW

4.0 TECHNICAL OVERVIEW

The following sections provide descriptions of the various field activities performed during this RI to address the data gaps identified and presented in the SSIP. Based on the results of initial field investigations from the SSIP, additional supplemental investigations were required to complete delineation of contaminants in soil, groundwater, and buried waste. The supplemental investigations were performed based on the SGSP and as otherwise directed by NJDEP. These activities included the investigations of the following media: soils; groundwater; sediments; surface water; and various waste and fill materials. Additionally, natural resource, baseline ecological, and receptor evaluations were conducted.

All on-site sampling and investigation activities were performed in accordance with the New Jersey Technical Requirements For Site Remediation, (NJDEP, July 1997), the New Jersey Field Sampling Procedures Manual (NJDEP, May 1992) and, where applicable, other relevant or appropriate USEPA regulation and guidance for conducting investigations at uncontrolled hazardous contamination sites. All field investigative procedures, unless otherwise noted, were conducted as detailed in the Programmatic QAPP (Berger, November 1998) and specified in the SSIP and SGSP. Additionally, all field activities were performed in accordance to procedures set forth in the Programmatic HASP (Berger, August 1998) and the Site Specific Health and Safety Plan (SSHASP)(Berger, January 1999).

The following subsections will describe the implementation of the investigative activities presented in the SSIP and the SGSP, and will note and explain any deviations from the planned SSIP and SGSP procedures.

4.1 SITE SURVEY AND MAPPING

As described in the SSIP, a detailed site map was created for the Matteo property showing Site topography and all pertinent existing Site features (Figure 2-1). Prior to initiation of sampling activities, the Site and adjacent areas were aerially photographed and a boundary survey was conducted. Data from the aerial photos and boundary survey were used to generate the topographic site plan used to guide the RI field investigation, and used as the geographic basis for many of the subsequent analyses, reporting and figures contained within this RIR.

At the conclusion of field investigation activities, the horizontal and vertical locations of all new RI related monitoring wells, test pits, deep soil borings, Geoprobe borings and stream gauges were surveyed and included in the comprehensive site plan. Additionally, the locations of all surface soil and sediment samples collected during the RI field investigations were surveyed using a Global Positioning System (GPS) unit. All horizontal data were surveyed and plotted in the New Jersey State Plane Coordinate System (NAD83), and vertical elevation data were recorded in the North American Vertical Datum (NAVD88). The resulting topographic site plan with surveyed monitoring well data and sample locations will be included with this Final RIR as a supplemental electronic deliverable in AutoCAD file format.

4.2 SOIL INVESTIGATIONS

Four main types of soil investigations were conducted at the Site:

- PCB Delineation In Surface Soils
- Shallow and Deep Monitoring Well Borings
- Junkyard/Lead Sweating Area Geoprobe Borings
- Test Pit Investigation

Each of these investigative activities is discussed in the following subsections.

4.2.1 PCB Delineation in Surface Soils

As part of this RI, surface soil sampling was conducted to assess and delineate the extent of previously identified PCB contamination, as well as screen other discrete areas sitewide that have not been previously investigated for PCBs. Descriptions of field activities for PCB delineation of surface soils are presented below. Refer to Table 4-1, Soil Sample Summary, for a complete listing of PCB samples collected, sample depths, locations, types of analysis, sampling method and dates. Refer to Figures 4-1 through 4-4 for sample locations at each of the four depth intervals sampled: 0-6", 12-18", 24-30" and 36-42".

As planned in the SSIP, it was anticipated that a combined maximum number of samples screened and/or analyzed for surface soil PCB delineation from both the previously identified PCB areas and the unsampled sitewide areas would total 257: 174 immunoassay screened; and 83 laboratory tested. However, due to the greatly expanded delineation effort needed at the previously known contamination area, a total of 457 soil samples were collected for sitewide PCB surface soil delineation: 260 samples screened with immunoassay kits; and an additional 187 samples (plus 10 duplicates) analyzed at the laboratory. Based on the unanticipated widespread distribution and extent of PCB contaminated soil, the total number of samples collected, screened and/or analyzed was nearly double the amount originally planned for this task.

Delineation of Previously Identified PCB Contamination

As shown in Figure 5 of the SSIP, soil samples from a previous NJDEP investigation in 1997 yielded detections of PCBs above NJDEP Soil Cleanup Criteria (SCC) at seven locations distributed mainly in the northwestern quadrant of the Site, and at one off-site location near the adjacent trailer park to the south. Thirty-two other sampling locations from that investigation failed to produce PCB concentration exceeding criteria; these clean samples were distributed primarily along the southern edge of the Site bordering the trailer park and in the far northwestern Site corner. Several other clean samples were also collected in the southeastern quadrant and central Site areas.

The SSIP originally called for additional surface soil sampling around each of the eight locations previously identified with PCB exceedances for horizontal and vertical delineation. However,

upon the Department's direction, the off-site trailer park location was deleted from further sampling; delineation sampling was, therefore, conducted only at the seven remaining previously identified on-site locations.

As planned in the SSIP, a maximum of eight new hand augered borings would be centered around each of these seven previously identified SCC exceedance areas to delineate PCB contamination (planned total of 56 borings). It was estimated that samples from two vertical intervals (0-6 inches and 12-18 inches) per boring would be necessary to complete vertical and horizontal delineation at each area. Therefore, a total of 112 samples (16 samples per sampling area) were scheduled to be collected and field screened for PCBs with immunoassay kits to determine horizontal and vertical delineation at these seven areas. From these 112 field screened samples, approximately 70 samples (including QA/QC samples) were to have been sent to an analytical laboratory for further PCB analysis to confirm the results of the immunoassay kit field screening.

Per the SSIP, two samples were initially collected from each of eight borings augered at 10-foot horizontal intervals distributed radially (north, south, east and west) centered on each of the seven previously identified exceedance locations. All samples were field screened with immunoassay kits to direct the surface soil investigation and determine which samples would be sent to the lab for confirmatory analysis. All samples that were below 0.50 ppm and used to delineate both a horizontal and vertical clean zone were sent to the laboratory for confirmatory analysis. An additional 10% of all samples with PCB concentrations above 0.50 ppm were also sent for confirmatory analysis.

Based on the immunoassay screening and analytical results indicating that PCB concentrations greater than the SCC of 0.49 mg/kg were present in many of the initial 112 samples collected at the seven targeted exceedance areas, neither horizontal nor vertical PCB delineation was achieved. These initial results indicated that both the horizontal and vertical extents of PCB contamination were more widespread than originally estimated. Instead of seven discrete, separate areas of contamination, the sample results indicated that extent of contamination at each area overlapped adjacent areas; thus, forming a large single contiguous area of contaminated shallow surface soils (0-6") in which all seven initial target locations were imbedded. Based on these preliminary results and as directed by the Department, the surface soil delineation investigation at these areas was expanded beyond the original SSIP scope of work.

The expanded delineation effort consisted of a much larger sampling area (roughly 800-feet long by 400-feet wide), wider sample distribution, and greater numbers of samples collected, screened and analyzed than originally anticipated. From each initial area (i.e. SS22) of investigation, additional borings were augered at 20-30 foot intervals outward in an effort to delineate the extent of shallow soil contamination. At each additional boring, a shallow (0-6 inch) sample was collected and immunoassay field screened for PCBs. If screening indicated that the shallow sample was below criteria, then it was determined that horizontal delineation had been achieved in that direction, and that sample was sent to the laboratory for confirmatory analysis. If, however, screening indicated that the shallow sample was above criteria, then it was determined that horizontal delineation had not been achieved, and an additional boring was augered, sampled

and screened at 20-30 foot intervals outward until horizontal delineation was achieved in that direction.

Once horizontal delineation was achieved in the shallow soils (0-6 inch) via this outwardly stepped process, samples were collected at deeper intervals (12-18, 24-30, 36-42, or 48-54 inches) as needed at the previously sampled boring locations in an effort to vertically delineate PCB contamination. Vertical delineation was determined typically at 60 ft. increments starting from the last detected exceedance in the surface soils in a specific direction (i.e. north) back to the origin (i.e. SS22). At each vertical delineation boring, if screening indicated that the sample was above criteria, then it was determined that vertical delineation had not been achieved, and an additional sample was collected and screened at a deeper interval as previously indicated above. However, if screening indicated that the sample at a given depth was below criteria then it was determined that vertical delineation had been achieved at that location, and that sample was sent to the laboratory for confirmatory analysis.

This expanded delineation investigation resulted in the total number of sampling locations and samples collected for immunoassay screening and laboratory analysis to greatly exceed the originally planned amounts described in the SSIP.

Site-Wide Screening of PCB Contamination

In order to fill data gaps in the known extent of surface soil PCB contamination, this phase of the delineation effort was focused on screening those areas of the Site that were not included in the July 1997 sampling event. Per the SSIP, 20 separate locations sitewide were planned for PCB screening and analysis. From these 20 areas, it was anticipated that approximately 30 samples would be collected and screened via immunoassay kits, and an additional 28 samples would be laboratory tested for results confirmation.

As directed by the Department during this RI field investigation, however, only 15 of these locations were actually sampled to investigate the presence of PCB contamination in previously unsampled shallow surface soils. A sample was collected from the 0-6 inch interval at each location via hand auger and screened using the immunoassay kit as previously discussed. If the PCB concentration was below 0.50 ppm, then delineation at that location was determined to be complete and no further sampling was needed. However, if the PCB concentration was greater than 0.50 ppm, then the same, outwardly radial patterned vertical and horizontal delineation sampling process as conducted at the previously identified locations was implemented as needed to delineate the extent of contamination.

Unlike the delineation effort at the previously identified contamination areas, initial immunoassay screening and laboratory results did not indicate the need for an expanded delineation program at these areas, therefore, the total numbers of sampling locations and samples collected did not exceed the originally planned amounts described in the SSIP.

4.2.2 Junkyard/Lead Sweating Area

According to the previous PA/SI for the Site (NJDEP, December 1996), surface soil samples showed uniform lead contamination throughout the Junkyard/Lead Sweating Area with elevated concentrations of cadmium, arsenic, copper and PCBs. The PA/SI, however, left data gaps in soil at depth that needed to be filled as part of this RI. Therefore as planned and described in the SSIP, ten (10) geoprobe borings were advanced on September 11, 2000 to investigate the area's soil from the surface to water table depths (approximately 10-12 feet) and to identify potential impact from past operations. Based on the findings of the September investigation and as planned in the SGSP, 35 additional soil borings were advanced in October 2001 and April 2002 to better define and delineate the horizontal and vertical extents of PCBs and Metals identified in during the September, 2000 investigation. The locations of these borings were biased toward areas of visible surficial staining or historically active areas. Refer to Figures 4-5 through 4-7 for the locations of the soil borings in this area. Refer to Table 4-1, Soil Sample Summary, for a complete listing of samples collected at these borings, sample depths, types of analysis, sampling methods and dates. Appendix B provides soil boring logs for the Geoprobe and hand auger borings.

Per the SSIP, the initial ten soil borings were advanced and continuously sampled to the water table (approximately 11.5-feet). Two (2) samples were collected from each boring for chemical analysis: one surface soil sample from the 0-6 inch bgs interval; and one sample from the 6-inch interval immediately above the high water table. The shallow surface soil sample from each boring was analyzed for TAL Metals, TCL Pesticides/PCBs, and pH. The deeper sample just above the water sample from each boring was analyzed for a full TCL/TAL suite of parameters and pH. One (1) additional soil sample for every 20 samples for each analytical method was collected as a blind duplicate for QA/QC purposes.

Based on the September, 2000 investigation, PCBs and Metals were identified as the predominant contaminants distributed ubiquitously throughout the Scrapyard Area at the shallow and localized areas at the water table. An additional 35 soil borings were advanced to better define the horizontal and vertical extents of contamination. Twenty-two soil borings were advanced via a geoprobe rig and continuously sampled to the water table (approximately 11.5-feet) and 13 soil borings were advanced via hand auger techniques to a maximum depth of four feet. Samples were collected from each boring for chemical analysis to determine horizontal and vertical extents of contamination as summarized below for the surface soil (0-2 ft), intermediate interval (2-4 ft) and deep interval (10-12 ft). Based on the location of the boring and previous sample results, samples were analyzed for PCBs and/or TAL Metals to fill the data gaps. One (1) additional soil sample for every 20 samples for each analytical method was collected as a blind duplicate for QA/QC purposes.

Surface Soil Sampling (0-2 ft): As shown on Figure 4-5 and summarized in Table 4-1, a total of 47 additional samples were collected and analyzed from this surface soil interval as part of the SGSP. Thirty-one (31) samples were collected from geoprobe borings labeled GP-5, GP-7 and GP-12 through GP-33; and 16 samples from hand augered borings HA-1 through HA-13A. All 47 samples were analyzed for PCBs. However, based on the expectation that full horizontal delineation for Metals in shallow surface soil could not be achieved for the northern portion of

Scrapyard Area, only 23 samples from selected locations were analyzed for Metals as per the SGSP. A total of 57 samples were collected from the surface soils.

Intermediate Soil Sampling (2-4 ft): As shown on Figure 4-6 and summarized in Table 4-1, a total of 28 additional samples were collected and analyzed from this interval. Twenty-five (25) samples were collected from geoprobe borings labeled GP-7 through GP-31; and three (3) samples from hand augered borings HA-1 through HA-3. Twenty-six (26) samples were analyzed for PCBs. Based on the results from the previous interval for two (2) samples (GP-7D and GP-30E), PCB analysis was not required for vertical delineation. However, based on the surface soil results (i.e. below criteria) and per the SGSP, only 16 samples from selected locations were analyzed for Metals.

Deep Soil Delineation (10-12 ft): As shown on Figure 4-7 and summarized in Table 4-1, a total of 19 additional samples were collected and analyzed from this interval. Nineteen (19) samples were collected from geoprobe borings labeled GP-12 through GP-34. All 19 samples were analyzed for PCBs. However, based on the surface and intermediate soil results (i.e. below criteria) and per the SGSP, only nine (9) samples from selected locations were analyzed for Metals.

4.2.3 Shallow and Deep Monitoring Well Borings

As per the SSIP and the SGSP, a total of 20 exploratory soil borings were drilled to document the subsurface soil conditions, and to help identify the optimum depths at which deep well screens would be installed. One boring was drilled at each well or well couplet installation location. See Figure 2-1 Site Plan, for locations of these monitoring well related borings. Refer to Table 4-1 Soil Sample Summary, for a complete listing of samples collected at these borings, sample depths, types of analysis, sampling methods and dates. Appendix B provides drilling logs for all borings. The results of select sample grain size analysis are presented in Appendix C.

Twelve (12) of the shallow borings (labeled MW1 through MW12) were drilled in preparation for shallow well installation. The shallow soil borings were continuously split-spoon sampled until such a depth was reached to allow for a sufficient length of the well screen to bridge the water table. At each of the shallow well borings, one soil sample was collected from the well-screened interval. Each of these soil samples was collected for geotechnical analysis (grain size, total organic carbon (TOC), and pH). After logging and sampling, each of these 12 borings was completed as a shallow monitoring well screened across the water table.

Six (6) deep borings (labeled B13 through B18) were drilled at proposed deep and shallow well couplet locations. These deep borings were used as preliminary, exploratory pilot holes drilled prior to well installation for the purpose of lithological logging and to identify the appropriate depth interval for deep well screens. The pilot borings were sampled continuously and logged to a depth of 20-feet; deeper samples were then collected at 5-foot intervals until the completion of the boring (approximately 100-feet). Although all of the deep pilot borings were originally scheduled to be drilled to 100-feet bgs, three of the pilot borings (B16, B17 and B18) were terminated prior to reaching the planned depth due to geological characteristics of the borings (loss of drilling fluid due to a very porous media). At each of the six deep borings, five

geotechnical samples (grain size, TOC, and pH) were collected from each lithology encountered, as well as one sample from each of the anticipated screen intervals for the deep wells. Two (2) additional borings were advanced at MW-10 and MW-11 for installation of two (2) new deep monitoring wells (MW-10D and MW-11D) that were required based on the initial two (2) rounds of groundwater sampling as described in Section 5.2. Upon completion of the deep pilot borings, the boreholes were grouted to the surface, and deep and shallow well couplets were installed nearby at each boring location.

In addition to collecting geotechnical soil samples, environmental samples were collected at selected deep and/or shallow borings based upon the following criteria:

- Two (2) soil samples were collected for chemical analysis at each of three well boring locations where contamination/waste material was encountered (MW-1, B16, B18).
- The first soil sample was collected from the interval exhibiting either the highest PID reading or most visible zone of contamination or directly below the deepest zone of waste material.
- The second sample was collected from the six-inch interval above the high water table.

A total of six (6) such samples were analyzed for TCL/TAL and pH. See Table 4-1 for a listing of samples collected for chemical analysis.

4.2.4 Test Pit Investigation

As planned in the SSIP, 62 test pits (TP-1 through TP-56) were excavated to determine the extent and depth of battery casings and other buried wastes along the banks of Hessian Run, and to investigate other cleared areas suspected of containing waste. Piles of surface debris (metal, tires, and gas cylinders) were encountered north of the active junkyard. These piles and the area around, them were not investigated due to the presence of the gas cylinders. Based on observations and sample results from the initial investigation an additional 28 test pits (TP-60 through 88) were dug sitewide to better delineate the horizontal and vertical extents of buried fill material, better define the nature of the fill, and to search for evidence of active or previous sources of soil and/or groundwater contamination. Using a trackhoe excavator, the 90 test pits were dug on average 20-feet long, 4-feet wide, and a to a maximum depth of 15-feet. The test pits were logged for lithology and for the presence or absence of battery casings and other waste material. Additionally, soil and waste samples were collected for chemical analysis. See Figure 4-8 for test pit locations, and refer to Excavation Logs in Appendix B for details of test pit dimensions and materials encountered. See Table 4-1 for a complete listing of test pit samples collected for analysis.

All excavated soil was visually inspected for evidence of contamination and field screened for volatiles with a PID. A soil sample was collected directly below the waste material, if encountered, and directly above the water table in each test pit; in several cases, the water table was encountered within the buried waste material. From the test pits, a total of 62 soil samples were analyzed for TAL Lead, pH and TPH. If elevated PID readings, visible staining, noticeable odor, or unusual waste material were encountered, additional analyses were conducted. In these instances of apparent contamination, 37 samples were analyzed for TCL Volatiles, TCL Semi-Volatiles, TCL Pesticides/PCBs, TAL Metals, plus pH (TCL/TAL and pH). One (1) additional

soil sample for every 20 samples for each analytical method was collected as a blind duplicate for QC purposes. All excavated soils were used, regardless of screening results, to backfill the excavations.

As a supplement to the test pit investigation, and as directed by the Department, 18 additional surface soil sampling locations (not originally planned in the SSIP) were hand augered along the southern Site boundary near the trailer park and in other selected locations suspected to potentially have impacted soil. From these 18 locations, 19 surface soil samples were collected for analysis. Seven (7) of these soil samples were analyzed for Lead, pH and TPH; 12 samples were analyzed for a full TCL/TAL and pH suite of parameters. All samples were collected with stainless steel spoons or hand auger. See Figure 4-8 for surface soil sample locations, and refer to Table 4-1 for a complete listing of samples collected for analysis.

4.2.5 Soil Characterization Sampling

As planned in the SGSP, a total of five (5) soil samples (sample locations labeled T-1 through T-5 on Figure 4-8) were collected from various site areas known to have contaminated soil. The general areas from which characterization samples were collected are as follows:

1. Scrapyard – from the area of metal contamination.
2. Household Trash – from along the banks of the Hessian Run.
3. Battery Casings – from along the banks of the Hessian Run.
4. Battery Disposal Area – battery casing from the battery disposal area.
5. Open Field – from the PCB contaminated soil.

These five (5) samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) for the purposes of disposal classification. Characterization sample analyses, locations and sample depths are summarized in Table 4-1. The boring logs for each location are provided in Appendix B. The results of the TCLP characterizations will be used to determine disposal methods and estimate costs for the Remedial Action Selection Evaluation.

4.3 STREAM GAUGE INSTALLATION

A total of four stream gauges were installed in the surface water bodies that bound the Site (Woodbury Creek and Hessian Run) to monitor surface water elevation and the fluctuations of the tides. Two (2) stream gauges were installed in the Woodbury Creek (SG-1 and SG-2) and two in the Hessian Run (SG-3 and SG-4). The four (4) stream gauge locations are shown in Figure 4-9. Following installation, each stream gauge was surveyed for horizontal location and elevation. The four (4) stream gauges, in conjunction with National Oceanic and Atmospheric (NOAA) tidal prediction data for Woodbury Creek, were used in the groundwater monitoring/tidal study and to determine appropriate surface water/sediment sampling activity times. See Appendix D for NOAA tidal data.

4.4 MONITORING WELL INSTALLATION

As planned in the SSIP, a total of 24 monitoring wells were initially installed at the Site to assess the flow patterns and water quality of both the shallow and deep groundwater regimes at the Site: 18 shallow wells and 6 deep wells. As planned in the SGSP, two (2) additional deep monitoring wells (MW-10D and MW-11D) were installed to fill data gaps from the initial investigation regarding the quality of upgradient groundwater entering the Site from the west and northwest. See Figure 2-1 for the locations of all 26 installed RI related monitoring wells. Refer to Appendix B for all drilling logs, well construction diagrams, well records and permits, and Forms A and B.

4.4.1 Shallow Monitoring Well Installation

The 18 shallow wells labeled MW1 through MW18 (with screens bridging the water table) were installed to document the horizontal flow pattern of the water table at the Site. These wells provide the data necessary to document site-wide groundwater discharge patterns and identify the location of the water table divide on the peninsula on which the Site is situated.

The two wells that were installed nearest to the Site's eastern edge (MW1 and MW14) were designed to provide background data to assist in establishment of groundwater flow patterns. A line of wells was installed within the identified landfilled area along Hessian Run to document the direct impact of the waste on groundwater quality (MW4, MW5 and MW13). The locations of these wells were selected within the landfilled area, but above the high water line. Two additional lines of wells were installed upgradient of the identified landfilled bank, within the property and biased towards potential areas of concern such as the location of the former "lead sweating" operation. A line of wells was also installed along the southern property boundary. The wells were located along these lines to obtain groundwater information to properly contour the groundwater flow. Six (6) of these shallow wells were paired with the deep wells (MW13 through MW18). All shallow wells were installed via hollow stem auger and were constructed in accordance with *NJDEP Monitor Well Requirements for Unconsolidated Aquifers* (March 1992) and Section 4.8.1 of the Programmatic QAPP. These wells were constructed using 10 feet of 4-inch diameter, 0.020-inch slotted PVC well screen which bridges the water table.

4.4.2 Deep Monitoring Well Installation

After completion of the deep borings discussed in Section 4.2.3, the resultant boring logs were evaluated and the deep well screen elevation was selected. The eight (8) deep monitoring wells (MW10D, MW11D, MW13D through MW18D) were located adjacent to the deep borings and were screened at approximately 55 to 65-feet BMSL. This interval was selected assuming that the medium to fine sand with fine gravel encountered would be an effective water-producing zone. The uniform deep screen elevation enables the horizontal gradient in the deep groundwater regime to be identified free of distortion by the anticipated vertical gradient. All deep wells were paired with a shallow well to investigate the anticipated vertical gradient. In all cases, the separation between the bottom of the shallow well screen and the top of the deep well screen is greater than 40-feet; this separation provides adequate measurement of the vertical gradient.

4.4.3 Monitoring Well Development

All new monitoring wells were developed according to the procedures described in the SSIP. Well development procedures began after completion of well installation. Development of both shallow and deep monitoring wells included continued groundwater pumping and surging until well water was as free of sediment as practical. In all cases, a minimum of three well volumes of water were removed. Based on field screening with a PID and visual observations, no evidence of gross contamination or free product was encountered, therefore all purge water derived from well development was discharged to the ground.

4.5 GROUNDWATER ELEVATION MEASUREMENTS/TIDAL STUDY

Prior to and following each round of synoptic groundwater elevation measurements, a reading from each staff gauge visible from the Site was taken to evaluate the tidal influence on groundwater elevation. At least one staff gauge was read for each round of water levels.

4.5.1 Groundwater Elevation Measurements

The December 4, 2000 round of groundwater sampling (Round 1) provided the initial round of synoptic groundwater measurements. The January 10, 2001 start of the tidal study provided a subsequent round of groundwater measurements. The January 25, 2001 round of groundwater sampling (Round 2) provided two rounds of groundwater elevations (high and low tide). Each round of water levels was collected over approximately a two hour time period. These water level readings were subsequently subtracted from the surveyed well elevations to establish a water level elevation at each location. Staff gauge readings were recorded during each round of water levels. Refer to Table 4-2 for recorded groundwater and surface water elevations. See Figures 4-10 and 4-11 for locations of recorded elevations used for shallow and deep groundwater contouring.

4.5.2 Tidal Study

Between January 10 and January 25, 2001, a tidal study was performed to establish tidal influence, to determine lag times and mixing zones on the Site, and to evaluate the effects of Hessian Run and Woodbury Creek on the Site's groundwater system.

The tidal study consisted of installing remote down-hole data loggers (Solinst Dataloggers) in seven (7) of the on-site wells, one (1) atmospheric, and one (1) adjacent to the stream gauge located in Woodbury Creek west of NJ Route 295. The on-site data-loggers were installed in shallow monitoring wells MW09, MW10, MW11, and MW12, and in deep monitoring wells MW14D, MW15D, and MW18D. Temperature and changes in head levels were recorded every 10 minutes during the 2-week test cycle.

4.6 GROUNDWATER SAMPLING

As planned in the SSIP, two comprehensive groundwater sampling events were executed at the Matteo Site, Round 1 (December 4 through December 8, 2000), Round 2 (January 25 through February 2, 2001), Round 3 (April 9 and 10, 2002). Round 1 and 2 included the 24 newly installed monitoring wells plus two on-site and neighboring potable wells. Round 3 included six deep monitoring wells. Additionally, an adjacent potable well was sampled twice on October 25 and November 8, 2001. See Figures 4-12 and 4-13 for the sampled well locations for each round, and refer to Table 4-3 for a complete listing of groundwater samples collected for analysis.

4.6.1 Monitoring Wells: Round 1

Following collection of water level measurements, dedicated Teflon lined polyethylene discharge tubing was installed in each well. A Grundfos Redi-flo® 2-inch stainless steel submersible pump was then used to evacuate (purge) groundwater prior to sampling. Round 1 sampling was conducted using traditional purging and sampling techniques. The parameters monitored during purging were turbidity, pH, dissolved oxygen, specific conductivity, temperature, and groundwater elevation. See Appendix E for detailed sample purge logs.

After well purging and water stabilization requirements were met, groundwater samples were collected using a disposable Teflon hand bailer. The samples were analyzed for TCL/TAL (filtered and unfiltered metals). One (1) additional groundwater sample for every 20 samples for each analytical method was collected as a blind duplicate for QA/QC purposes. Additionally, one (1) field blank sample was collected for each day on Site for each analytical method, and one (1) trip blank supplied for each sample cooler containing volatile organic samples.

4.6.2 Monitoring Wells: Round 2

Round 2 of groundwater sampling was conducted 48 days after Round 1. This sampling event was conducted using a low-flow technique. The samples collected were analyzed for the same parameters as specified in the first sampling event. Because low-flow purging and sampling techniques were used for this sampling round, filtered metal samples were not required. The low-flow method of purging and sampling was conducted in accordance with the U.S. Environmental Protection Agency's (USEPA) *Ground Water Sampling Procedure: Low Stress (Low-Flow) Purging and Sampling* (USEPA, March 1998). The parameters monitored during purging were turbidity, pH, dissolved oxygen, specific conductivity, Eh, temperature and groundwater elevation. See Appendix E for detailed sample purge logs.

After well purging and water stabilization requirements were achieved, groundwater samples were collected directly from the pump effluent. The samples were analyzed for a full TCL/TAL suite of parameters. One (1) field blank sample was collected for each day on Site for each analytical method, and one (1) trip blank per sample cooler containing volatiles organic samples.

4.6.3 Monitoring Wells: Round 3

Following collection of water level measurements, a Grundfos Redi-flo[®] 2-inch stainless steel submersible pump was then used to evacuate (purge) groundwater prior to sampling. Round 3 sampling was conducted using traditional purging and sampling techniques. The parameters monitored during purging were turbidity, pH, dissolved oxygen, specific conductivity, temperature, and groundwater elevation. See Appendix E for detailed sample purge logs.

After well purging and water stabilization requirements were met, groundwater samples were collected using a disposable Teflon hand bailer. The samples were analyzed for TCL Volatiles and unfiltered TAL Metals. One (1) additional groundwater sample for every 20 samples for each analytical method was collected as a blind duplicate for QA/QC purposes. Additionally, one (1) field blank sample was collected for each day on Site for each analytical method, and one (1) trip blank supplied for each sample cooler containing volatile organic samples.

4.6.4 Potable Wells: Rounds 1 and 2

Due to the analytical results of the August 1994 potable well sampling, the unknown extent of the on-site contamination, and the heavy usage of the aquifers in the area for potable water supply, samples were collected from two (2) nearby potable wells during round 1 and 2 of groundwater sampling events: one on-site well designated as the PW-2 (Matteo Well); and one neighboring off-site well at the adjacent residence north of the scrap yard area designated as the PW-1 (House Well). For each sampling round, the two potable wells were purged for fifteen minutes prior to sampling. The samples were analyzed for the following suite of parameters using analytical methods specifically chosen to comply with potable water testing standards: volatile organics (USEPA Method 524.2, Version 4.0), semi-volatiles (USEPA Method 525.2), TAL Metals (40 CFR 141/143), and pesticides/PCBs (USEPA Method 505).

No treatment system was encountered at the on-site Matteo Well and, therefore, the well was purged and sampled from an outside spigot behind the scale house. During purging and sampling of the Matteo Well, a strong rotten egg odor was emitted from the purge water.

The adjacent House Well was observed to have a treatment system consisting of: a 5-micron filter and a three-stage charcoal and salt filter were located in the basement of the house. Therefore, the sampling point was selected at a valve located prior to the treatment system within the well box and just above the wellhead. At both potable well locations, field personnel were unable to access the wells to determine their total depths or the elevation of the water table.

4.6.5 Potable Well PW-3

Based on the findings from the well search, presented in Section 5.7, a potable well (PW-3) was found to be located adjacent to the site at Billy-O-Tire (Lot 8, Block 325). As directed by NJDEP, two (2) rounds of water samples were collected from PW-3 on October 25 and November 8, 2001 by purging the potable well for fifteen minutes prior to sampling. The samples were analyzed for the following suite of parameters using analytical methods

specifically chosen to comply with potable water testing standards: volatile organics (USEPA Method 524.2, Version 4.0) and TAL Metals (40 CFR141/143).

No treatment system was encountered at the Billy-O-Tire well and, therefore, the well was purged and sampled from an inside spigot located at the back of the garage. Field personnel were unable to access the potable well to determine the total depth or the elevation of the water table.

4.7 HYDRAULIC CONDUCTIVITY TESTING

Rising head tests were conducted to estimate horizontal hydraulic conductivity to be used in estimations of groundwater seepage velocity. Many of the shallow wells are screened in perched groundwater. The primary path for offsite migration via groundwater is in the deep zone. The rising head tests were performed on three (3) deep wells (MW14D, MW16D, and MW17D). The rising head test consisted of recording the recovery rate of the water level after drawdown from the volume of water removed during the well development process. See Figure 2-1 for the locations of these tested wells. Refer to Appendix F for the hydraulic conductivity data set collected.

The hydraulic conductivity testing was conducted by placing a transducer in each well at a depth above the development pump. During all tests, one transducer was placed in another well (above the water table) located away from the testing area to record atmospheric pressure changes. A constant pumping rate was maintained during the development process (approximately 10 gpm). After the development process was completed, the pump was turned off and the transducer recorded the recovery of groundwater levels. Water level measurements were recorded every three (3) seconds to verify recovery within 90% of the initial pre-development water level. After the water level stabilized the transducer was removed from the well. The test data was analyzed using the Bouwer and Rice Method (Bouwer, H. and R. C. Rice, 1976). The transducer in MW14D did not record the full recovery of the well.

4.8 SEDIMENT AND SURFACE WATER SAMPLING

Elevated concentrations of lead and PCBs were detected in sediment and surface water samples collected from Hessian Run in August 1996 adjacent to the Matteo Site. As a result of the tidal conditions of surface water near the Site, contaminants originating from the Matteo Site have the potential to be transported in the surface water and deposited in the sediments of Woodbury Creek, Hessian Run, and the intertidal flats. As per the SSIP, sediment and surface water samples were collected from both Woodbury Creek and Hessian Run and across three inter-tidal flats adjacent to the Site. The locations of these samples were accessed using an amphibious vehicle. Prior to initiation of sediment and surface water sampling activities, stream (staff) gauges were installed in Hessian Run and Woodbury Creek to monitor surface water elevation during sampling activities.

4.8.1 Sediment Sampling

A total of 416 sediment samples were collected from 145 separate locations along transects and at discrete locations. Refer to Table 4-4 for a complete listing of sediment samples collected for

analysis. See Figures 4-15 through 4-20 for all sample locations. The results of the grain size analyses are presented in Appendix C. A total of 28 transects were sampled across the two tidally influenced channels. Three of these transects served to document background conditions in two upgradient branches of Hessian Run and the upgradient branch of Woodbury Creek (T1, T25, and T30). Fourteen (14) other discrete sample locations (S1 through S14) were located within the inter-tidal flat areas. All samples were collected and analyzed as described in the SSIP, except as otherwise noted below.

Several deviations from the SSIP occurred based on observed field situations and as directed by the Department. Sediment samples were originally planned to be collected from 30 transects, however, modifications were made during the field activities to eliminate two (2) of these transects (T10 and T12) based on their proximity to the adjacent transects T9 and T11. Additionally, for five (5) transects (T4 through T8) the Department recommended collecting the samples from only the three (3) sample locations closest to the Site. The other sample locations for those transects were dependent on the laboratory results. Samples were only collected from the 0-6 inch interval for seven (7) discrete locations (S1 through S6 and S14). Due to unanticipated field conditions (poor recovery and auger refusal), field personnel experienced difficulty collecting individual samples from discrete depth intervals at five (5) locations from transects T21, T23 and T25 in the Woodbury Creek. Therefore, composite samples were collected at these five (5) locations (T21-B, T21-C, T23-D, T25-B, and T25-C), and indicated as "(comp)" samples on Figures 4-12 through 4-20.

As planned and unless otherwise noted above, each of the 28 transects sampled consisted of five (5) sample locations where a 3-foot deep sediment core was collected. One (1) sample location was in the deepest part of the channel, the thalweg. Two (2) sample locations along each transect were on the upper portions of the channel margin flats at opposite banks, collected as far as the tide stage at the time of sampling permits. The remaining two (2) sample locations were mid-way between the channel margin sample location and the thalweg sample location. The discrete sediment sample locations (S1 through S14) were situated near tributary tidal channels. These locations were selected to gather sufficient data to characterize the movement of contaminants through the sedimentary system. The intertidal flat sample locations were selected to characterize areas where humans are known to come in contact with sediment and that also serve as important natural habitats.

Sample collection was accomplished with a sediment sampler equipped with a 3-foot long core barrel with an auger or butterfly valve tip. The sampler had a handle to facilitate driving or twisting the core barrel, and a check valve to prevent wash out during retrieval through the overlying water layer. Where practical, three samples per core were obtained at discrete depths of 0-6 inches, 12-24 inches, and 24-36 inches for the samples taken at both transect and discrete individual locations. Each sample was analyzed for Lead, PCBs, TOC, pH and grain size. At each transect, the 0-6 inch interval sample closest to the Site was analyzed for a full TCL/TAL suite of parameters instead of just Lead and PCBs.

A GPS (Global Positioning System) unit was used to determine the location of each sediment sample location either along a transect or at a discrete location. Detailed field notes were taken which include time of day and condition of the tide (flood or ebb) at the time of sampling, a tide

gauge reading from the nearest tide gauge if visible, and observations regarding battery casings and other evidence of contamination.

4.8.2 Surface Water Sampling

A total of 24 surface water samples were collected from six transect locations in Hessian Run and Woodbury Creek: four (4) surface water samples per transect. Samples were collected from the mid-channel and the quarter channel nearest the Site at each of three background transects (T1, T25, and T30), and three other selected transects (T3, T12, and T18) that were located upstream, mid-stream and downstream of the Site along Hessian Run. Each location was sampled twice: at both high and low tides. In addition to surface water sampling, ten (10) seeps were sampled: eight (8) along Hessian Run and two (2) along Woodbury Creek. All seep samples were collected during an ebb tide. See Figure 4-9 for the locations of these surface water samples, and Figure 4-12 for seep sample locations. Table 4-3 provides a complete listing of samples collected for analysis.

At each mid and quarter channel surface water sample location, in-situ water quality parameters (pH, conductivity, DO, turbidity, temperature, and salinity) were measured. All water samples collected both from the channel and the seeps were analyzed for Lead (filtered and unfiltered), and hardness as CaCO_3 . Detailed field notes were taken which included time of day and condition of the tide at the time of all sampling and elevation measurements if visible. GPS was used to determine the location of each surface water and seep collected.

4.9 NATURAL RESOURCES INVESTIGATION

As specified in the SSIP, a natural resource inventory of the 120-acre study area (comprised of the 80-acre Site and adjacent estuary and wetlands) was conducted through a review of available background information and on-site field surveys in November and December of 2000. The wetland delineation was conducted to identify the upland-wetland boundary and the relative acreage of uplands and wetland habitats. An inventory of flora and fauna species likely to occur on the Site was also conducted, as well as an assessment of existing plant communities and habitats located on and adjoining the Site.

Prior to the field investigation, existing documentation was reviewed to assess the project Site. Resources reviewed included U.S. Geological Survey (USGS) topographic maps, the U.S. Fish and Wildlife Service (USFWS)-National Wetland Inventory (NWI) Mapping, the NJDEP Freshwater Wetlands Mapping, and the Natural Resource Conservation Service (NRCS)-Soil Survey for Gloucester County, New Jersey.

As part of the natural resource investigation, a wetland delineation Baseline Ecological Evaluation (BEE) were performed to establish the boundaries of any federal or state jurisdictional wetlands within the project Site and to determine the presence of potential ecological receptors to Site contaminants. Wetland boundaries were delineated in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (Federal Interagency Committee on Wetland Delineation, 1989) and the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). Both methods employ a three-

parameter approach (hydrophytic vegetation, hydric soils, and hydrology) for identifying and delineating wetlands. Upland and wetland habitats were classified in accordance with a Preliminary Natural Community Classification for New Jersey (Breden 1989), and inventoried for dominant plant species. Wetlands were also classified in accordance with Cowardin (1979).

The wetland/upland boundaries were identified and delineated in the field by the placement of sequentially numbered flags on vegetation. At representative points, transects were laid out perpendicular to the wetland/upland boundary and vegetation, soil, and hydrologic components were evaluated at two plots (wetland, upland) along each transect. The wetland flags were surveyed to submeter accuracy using a Trimble GPS Pathfinder Pro XR/XRS with Asset Surveyor global positioning system (GPS) unit and plotted on an aerial photograph.

Field surveys also included an inventory and assessment of existing habitats within the study area. During the field surveys, observations of wildlife and signs of their presence were recorded. The type and quality of habitats present, especially wetlands, were evaluated for the type of wildlife species they are likely to support. Existing literature was consulted to address bird and aquatic species likely to utilize the Site and adjoining wetlands and waters. Both the USFWS and the NJDEP Natural Heritage Program were consulted for information regarding threatened and endangered species.

4.10 MANAGEMENT OF INVESTIGATION DERIVED WASTE

Based on the results of field screening and visual observations of drill cuttings and well purge water generated during field investigations, no investigative derived waste (IDW) generated was determined to be hazardous. Based on these screening results, it was not deemed necessary to containerize any of the soil, water or personal protection equipment (PPE) IDW. All soil and water IDW, therefore, was disposed of on-site at the respective drilling, purging or sampling location; all PPE was disposed appropriately as non-hazardous trash.

4.11 POTENTIAL RECEPTOR EVALUATION

A well search was conducted to determine the potential receptors of the impacted groundwater in the area of the Site. The Gloucester County Department of Health and Human Services was contacted via phone and fax to identify any wells acting as potential receptors of groundwater contamination from the Site. A well search was performed at the NJDEP Bureau of Water Allocation pertaining to the following information: any monitoring and domestic wells within a one-half mile radius of the Site and any industrial, public supply wells, irrigation, and wells with water allocation permits within a five-mile radius of the Site.

5.0 FINDINGS

5.0 FINDINGS

This RI has been completed at the Matteo Iron and Metal Site in West Deptford, NJ in accordance with the approved SSIP as detailed in Chapter 4. The following is a discussion of the findings based on the data generated. The full analytical packages for all samples were submitted directly to the NJDEP by the laboratory.

5.1 SOIL

In Chapter 4, four general types of soil sampling and analysis were described in accordance with the SSIP:

- PCB Delineation In Surface Soils
- Shallow and Deep Monitoring Well Borings
- Junkyard/Lead Sweating Area Geoprobe Borings
- Test Pit Investigation

Due in part to field modifications described in Chapter 4, the results of these activities are more clearly presented in this Chapter in the following five general categories:

- PCB Delineation in Surface Soil - to determine extent of PCB contamination in surface soil
- Sitewide Surface Soil Sampling - to characterize the quality of the surface soil at debris areas sitewide
- Test Pit - to delineate the nature and extent of buried waste and to determine impact of waste disposal on underlying soil
- Geoprobe - to determine impact of scrapyard operations on surface and subsurface soil
- Soil Boring - to document Site stratigraphy and contaminant impact (if observed)

The results of each of these are discussed in the following subsections.

5.1.1 PCB Delineation in Surface Soil

Field screening via an immunoassay kit was conducted on 260 surface soil samples. To check the accuracy of the immunoassay analysis, 118 immunoassay samples were sent to the laboratory for confirmatory analysis. Only 11 of the 118 samples had contradictory results, providing a 91% confidence level. An additional 69 soil samples that were not subject to immunoassay analysis were submitted directly for laboratory analysis (for a total of 187 laboratory analytical samples). See Appendix G for surface soil sample descriptions.

The results of the PCB analysis of these surface soil samples are summarized in Table 5-1. Only Aroclors 1254, 1260, and 1248 were detected, with 1254 predominant. Comparison of total PCB concentration of each sample to the NJDEP Soil Cleanup Criteria shows that, of the 187 laboratory analytical samples, 42 exceed the Residential Direct Contact Soil Cleanup Criteria

RDCSCC) (0.49 mg/kg) and 29 exceed the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (2 mg/kg). Only nine of the 187 samples had PCB concentrations that were above 10 mg/kg, with the highest being 49 mg/kg.

The immunoassay and laboratory analytical sample locations and results are illustrated on Figures 4-1 through 4-4, which depict four different depth intervals (0-12", 12-18", 24-30", and 36-42"). Most of the samples are concentrated in the western portion of the Site. The initial sampling was distributed throughout the Site, but the western portion is the area where detections above criteria were encountered that required additional horizontal and vertical delineation.

The area exceeding the RDCSCC is indicated by shading on these figures. The highest concentrations were detected in the northwestern portion of the affected area. This area is consistent with the locations of roadways that supported the land-disturbing operations observed in the 1975 aerial photograph (Appendix A). The horizontal extent of contamination to the north was not fully delineated, as the buried waste along Hessian Run was encountered. The sequence of figures demonstrates that, vertically, the majority of contamination is limited to the top 2 feet of soil, while smaller pockets extend to more than 3 feet. Based on the measurements presented on these figures the estimated quantity of PCB-contaminated soil (exceeding RDCSCC; non-hazardous) is approximately 19,200 cubic yards in the top 2 feet and an additional 4,000 cubic yards below 2 feet.

5.1.2 Junkyard/Lead Sweating Area

Soil investigations were conducted within the Scrapyard Area consisting of a total of 45 soil borings with 158 soil samples. The locations of these soil borings (geoprobe and hand auger) are shown on Figures 4-5 through 4-7. Samples were collected from each boring for chemical analysis as detailed in Section 4.2.2 in accordance with the SSIP or the SGSP to delineate the horizontal and vertical extent of contamination for the surface soil (0-2 ft), intermediate interval (2-4 ft) and deep interval (10-12 ft). The results of the analyses are summarized and compared to the NJDEP soil cleanup criteria (Residential, Non-Residential, and Impact to Groundwater) in Tables 5-2 through 5-8. The intermediate and the deep intervals did not exceed NJDEP soil cleanup criteria for Impact to Groundwater. The analytes exceeding the NJDEP RDCSCC (metals and PCBs) are shown on Figure 4-5. Clean lines based on PCB and/or Metal concentrations below RDCSCC have been drawn for each depth interval to show the known horizontal extent of contamination at that depth. Discussions of the results for each soil depth interval are provided below. Drilling logs for all geoprobe and hand augered borings are provided in Appendix B.

Surface Soil Delineation (0-2ft): Refer to Tables 5-2 through 5-4 for the sample results compared to RDCSCC, NRDCSCC and Impact to Groundwater Soil Cleanup Criteria (IGWSCC) for this depth interval. See Figure 4-5 for the sample locations, RDCSCC exceedances and extent of PCB and/or Metals contamination exceeding RDCSCC.

Of the 57 surface soil samples collected during the RI, samples at 26 locations exceeded RDCSCC for total PCBs, 30 sample results were below criteria, and one sample was not analyzed for PCBs.

From the 33 samples analyzed for Metals, 19 samples indicated exceedances above RDCSCC for at least one of the following Metals: antimony, arsenic, barium, copper, lead, mercury, nickel, thallium, and zinc. The remaining 15 samples analyzed for Metals showed no RDCSCC exceedances. Of the Metals exceeding RDCSCC, lead was the predominant contaminant with 18 exceedances, antimony was the next leading contaminant with 12 exceedances. The number of remaining exceedances was: arsenic (4), barium (4), copper (8), mercury (1), nickel (2), thallium (1), and zinc (9).

Based on the results, a clean line connecting surface soil sample locations at which neither PCBs nor Metals exceeded criteria was able to be drawn around 3/4 of a roughly 6.3 acre area in the central portion of the scrapyard. This clean line represents the known horizontal extent of these contaminants in this 0-2 foot depth interval. The clean line and contamination extents are indicated on Figure 4-5.

As shown, a nearly continuous clean line could be drawn from the northwest corner of the area southward to the middle of the eastern boundary with only one small gap at location HA-10B along the southeast border. This single location produced a small PCB exceedance (0.58 mg/kg) slightly above RDCSCC. A single PCB exceedance and two lead exceedances at Locations GP-25 and GP-26 cause a break in the clean line in the northwest corner of the area. PCB and exceedances of several Metals - mainly lead - at locations HA-3, GP-23 and GP-31 produce a break in the clean line along the northeast edge of the scrapyard adjacent to known battery casing fill area along the Hessian Run creek. Due to current site conditions in and near the scrapyard (scrap metal piles, buried debris, battery disposal area, and Hessian Run), it was determined to be unlikely that full horizontal delineation for Metals in shallow surface soil could be achieved for the northern portions of this area. Based on these conditions and the expectation that continued surface soil PCB and/or Metals contamination was likely to be encountered northward toward the known battery casing areas and Hessian Run, it was determined by NJDEP that no further sampling was needed to attempt to fill the gaps in the clean line along the northwest and northeast borders of the scrapyard.

The area shown as the extent of contamination equals approximately 275,000 square feet, or roughly 6.3 acres. In the interval between 0-2 feet bgs, this area contains approximately 20,500 cubic yards of potentially PCB and/or Metals contaminated soil.

Intermediate Soil Delineation (2-4 ft): Refer to Tables 5-5 and 5-6 for the sample results compared to RDCSCC and NRDCSCC criteria for this depth interval. Since there were no sample results which exceeded IGWSCC criteria in this interval, a results table for that criteria was not generated. As indicated in the SSIP, no samples were collected at this depth interval during the initial investigation; therefore all results presented are solely from the October 2001 and April 2002 sampling events. See Figure 4-6 for the sample locations, RDCSCC exceedances and extent of PCB and/or Metals contamination exceeding RDCSCC (GP-23).

Of the 28 intermediate soil samples collected, only one location exceeded RDCSCC for total PCBs, 25 sample results were below criteria, and two samples were not analyzed for PCBs.

From the 16 samples analyzed for Metals, only one sample, GP-23, resulted in exceedances above RDCSCC for the following Metals: antimony, barium, lead, and zinc. The remaining 15 samples analyzed for Metals showed no RDCSCC exceedances.

Utilizing the sampling results for this interval, a clean line connecting intermediate soil sample locations at which neither PCBs nor Metals exceeded criteria was able to be drawn around 3/4 of an approximate 1.6 acre area in the northern half of the scrapyard. This clean line represents the known horizontal extent of these contaminants in this 2-4 foot depth interval. The clean line and contamination extents are indicated on Figure 4-6.

As shown, an unbroken clean line could be drawn clockwise from sample location GP-31 in the northeast corner of the area to sample location HA-3 toward the north. Only exceedances of PCBs and Metals at a single location, GP-23, prevented the full closure of this clean line. Exceedances of PCBs and several Metals - antimony, barium, lead and zinc - at this location produce a break in the clean line along the northeast edge of the scrapyard adjacent to known battery casing fill area along the Hessian Run creek. Due to current site conditions in and near the scrapyard (scrap metal piles, buried debris, battery disposal area, and Hessian Run), it was determined to be unlikely that full horizontal delineation for PCBs and/or Metals in intermediate soil could be achieved for the northern portion of this area. Based on these conditions and the expectation that continued PCB and/or Metals contamination was likely to be encountered northward toward the battery casing areas and Hessian Run, NJDEP determined that no further sampling was needed to attempt to fill the gap in the clean line along the northeast border of the scrapyard at this depth interval.

The area shown as the extent of intermediate contamination equals approximately 67,700 square feet, or roughly 1.6 acres. In the interval between 2-6 feet bgs, this area contains approximately 10,500 cubic yards of potentially PCB and/or Metals contaminated soil.

Deep Soil Delineation (10-12 ft): Refer to Tables 5-7 and 5-8 for the sample results compared to RDCSCC and NRDCSCC criteria for this depth interval. Since there were no sample results which exceeded IGWSCC in this interval, a results table for that criteria was not generated. See Figure 4-7 for the sample locations, RDCSCC exceedances and extent of PCB and/or Metals contamination exceeding RDCSCC.

Of the 30 soil samples collected, 27 samples were collected just above the groundwater interface between 10-12 feet bgs; the other 3 samples were collected from the 5-8 foot bgs range. Four samples indicated exceedances of PCBs or Metals (antimony, copper, and lead). A fully closed clean line connecting deep soil sample locations at which neither PCBs nor Metals exceeded criteria was able to be drawn for this interval. Approximate one (1) acre area in the northern half of the scrapyard is potentially contaminated with PCBs or Metals. This clean line represents the known horizontal extent of these contaminants in this deep soil interval. Since the extent of known contamination at this interval has been fully delineated with a closed clean line, it was determined that no further sampling was needed in this area. The clean line and contamination extents are indicated on Figure 4-7.

Although PCBs and Metals were detected above RDCSCC at location GP-2 (sample GP-2B) during the initial investigation, confirmatory samples were collected (GP-34) at the same location and depth indicated that PCBs and Metals were below RDCSCC. Based on this confirmatory sample result, a non detect from the intermediate soil sample, and the results of other clean samples in the immediate vicinity, no exceedances are believed to be located at 10-12 foot range at that location. It was determined, therefore, that no further sampling was needed in the GP-2 vicinity at this depth.

The area shown as the extent of deep soil contamination equals approximately 46,400 square feet, or slightly over 1 acre. In the interval ranging between 6-12 feet bgs, this area contains approximately 10,500 cubic yards of potentially PCB and/or Metals contaminated soil.

5.1.3 Soil Borings

Twenty soil borings (8 deep and 12 shallow) were advanced in association with the installation of the 26 monitoring wells at the Site. As the borings were advanced, split-spoon soil samples were collected. Soil descriptions recorded for each sample are presented on the drilling logs in Appendix B. Based on subsurface information collected, two site-specific Geological Cross Sections were created (Figures 3-3 and 3-4). The Cape May Formation, which is generally observed at the Site as a brownish yellow sand, is approximately 15 feet thick at the eastern side of the Site and approximately 40 feet thick on the western side. There appears to have been historic erosion of the Upper Cretaceous surface in the direction of the Woodbury Creek and Hessian Run confluence. What is interpreted as alluvium is encountered near Hessian Run and is observed as a layer of peat and organic sediments underlain by approximately 15 feet of grayish green sand. In the eastern and southern portions of the Site, the Merchantville Formation is encountered beneath the Cape May formation and is generally observed as very dark gray clays and silts. The Merchantville is approximately 20 feet thick at the eastern and southern boundaries of the Site but is not present in the northwestern quarter of the property. The Magothy formation underlies the above formations and extends at least to the full depth of the exploration of this RI (approximately 100 feet bgs). The Magothy Formation at the Site is generally observed as light gray sand with clay and silt lenses.

Apparent evidence of contamination identified in the field (PID, visual, or olfactory) prompted the collection of samples for laboratory analysis at three (3) boring locations (MW01, B16, and B18). Two samples were collected within the top 11 feet at each boring location and analyzed for TCL/TAL parameters, TOC and pH. The results of the TCL/TAL analyses are summarized and compared to the NJDEP soil cleanup criteria in Table 5-9; TOC and pH results are presented in Table 5-10. Exceedances of the criteria are shown on Figure 4-8. The only exceedance of the criteria was detected in the 2 to 2.5 feet bgs interval at B16. Five PAHs, PCBs, lead, and zinc are detected above the RDCSCC. The detections of lead, zinc, and benzo (a) pyrene were also above the NRDCSCC.

5.1.4 Test Pits

Ninety (90) test pits were excavated to characterize the nature and extent of buried waste at the Site. The majority of the investigation was conducted along Hessian Run. In addition, test pits

were excavated in other areas throughout the Site to address additional areas of potential concern. Three general areas of potential concern were noted; the area along Hessian Run, the area of dark staining seen in the 1975 aerial photograph, and the area of the former pond as seen in the 1959 aerial photograph (Appendix A). The locations of the test pits are shown on Figure 5-1. The test pit excavation logs are presented in Appendix B.

Delineation of Buried Waste

Various types of wastes were encountered during the excavations (Figure 4-8, Appendix B). The waste material was classified as battery casings (Fill-B), a mix of battery casings and general waste (Fill-M), and general waste (Fill-W) as indicated on the test pit excavation logs. The horizontal extent of the disposal area, with each of the three waste types identified, is presented on Figure 5-1. The vertical extent of the various wastes is depicted on a series of cross sections presented as Figure 5-2. The maximum depth of the waste is approximately seven (7) feet bgs. Based on the measurements presented on these figures, there is approximately 80,000 cubic yards of buried waste identified at the Site during this RI: 23,000 cubic yards of battery casings; 22,000 cubic yards of battery casings mixed with general waste; and 35,000 cubic yards of general waste.

Sample Analysis

Selected sample locations and analytical parameters were selected based on field observation of subsurface conditions. A total of 99 samples were collected. Twelve of the samples were collected from the waste material itself while the other 87 samples were collected from below the waste to document the impact on the underlying soil. Thirty-eight (38) samples were analyzed for full TCL/TAL analysis and pH. The other 61 samples were analyzed for TPH, lead, and pH. The results of the analyses are summarized and compared to the NJDEP soil cleanup criteria in Tables 5-12 through 5-14. In addition, exceedances of the RDCSCC are shown on Figure 4-8.

In the samples collected from the waste along Hessian Run, the predominant exceedance is lead, with concentrations ranging from 750 mg/kg (TP-27A) to 31,300 mg/kg (TP-3A). Lead is also detected above the criteria in the soil samples collected below the waste along Hessian Run, with concentrations ranging from 933 mg/kg (TP-9A) to 11,500 mg/kg (TP-35). Lead was not detected above RDCSCC in soil samples collected from below the waste at TP-2A, TP-27, and TP-28. Arsenic (21 mg/kg) was the only exceedance of RDCSCC (20 mg/kg) in the sample collected from the yellow material (TP-28C).

In the samples collected from test pits in the area of dark staining seen in the 1975 aerial photograph (TP6B, TP45, and TP74), lead, antimony, zinc, PCBs, as well as benzene and total xylene (in the pink material), were detected above the RDCSCC. In addition, ethyl benzene, chloroform, and 2,4-dimethylphenol were also detected above IGWSCC. The analytical results of soil samples collected below the waste in this area did not show any exceedance of criteria.

In the area of the former pond as seen in the 1959 aerial photograph, one large test pit (TP44) was excavated. Approximately two feet of a mix of battery casings and general waste was

encountered. The analytical results from the soil samples collected below this waste did not show any exceedance of criteria.

The supplemental test pits excavated along the western property line encountered general waste material. The sample results indicated exceedances of IGWSCC at TP-81 (TP-81C) and TP-86 (TP-86A). The TP-81 sample was observed to contain an unidentified pale blue/green clayey material with a PID reading of 472 ppm and a laboratory result of 280 mg/kg for xylene and 520 mg/kg for lead. However, laboratory results for two samples (TP-81B and TP-81C) collected from the native soils beneath the drum indicated all analytes below criteria. The TP-86 sample was observed to contain remnants of four drums. A sample was collected from the native soils and laboratory results indicated that Aroclor 1260 was detected at 460 mg/kg. No additional samples were collected in the vicinity of TP-86 due to limited signs of contamination observed from the excavation and hence the extent of contamination shall be determined during the remedial action.

The sample results show noncontiguous spots of contamination in soil - mainly Metals - spread ubiquitously throughout the site. These predominantly lead and antimony contaminated spots appear to be associated with the areas of observed battery and household waste fill materials buried around the site, as well as current metal recycling and storage operations in the active Scrapyard Area in the northeastern portion of the site. Although one sample along the western edge of the site produced the only VOC exceedance, xylene, this compound is usually associated with gasoline contamination and, as such, would not typically be attributable for the vinyl chloride contamination previously detected in downgradient groundwater.

5.1.5 Sitewide Surface Soil Sampling

Nineteen (19) surface soil samples were collected at eighteen (18) locations throughout the Site, as shown on Figure 4-8. The locations and analytical parameters were selected based on field observation of surface debris. Twelve of the samples were analyzed for full TCL/TAL analysis and pH. The other seven (7) samples were analyzed for TPH, lead, and pH. The results of the analyses are summarized and compared to the NJDEP soil cleanup criteria in Table 5-15. In addition, exceedances of the RDCSCC are shown on Figure 4-8. Lead exceeds in four samples ranging from 1,660 mg/kg to 14,500 mg/kg. These samples are in the central and southern portion of the Site along trails between the junkyard and the trailer park. The highest concentration was detected at the center of the southern Site boundary (TPSS-C1), adjacent to the trailer park. PCBs were detected at two locations: one on the north-central portion of the Site along Hessian Run (TPSS-L1 at 15.2 mg/kg) exceeding RDCSCC and NRDCSCC; and one on the center of the west boundary (FULL2 at 0.53 mg/kg) above the RDCSCC.

5.1.6 Soil Characterization Sampling

A total of five (5) soil samples collected from various site areas known to have contaminated soil and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) for the purposes of disposal classification. See Figure 4-8 for locations of all characterization samples, Table 5-16 for analytical results, and Appendix A for boring logs.

Of these five samples, only two indicated exceedances of RCRA standards. These exceedances were reported at the T2 household trash location in the north central portion of the site, and at the T4 battery disposal area in the area just north of the active scrapyard; both samples produced RCRA exceedances for lead only. No other exceedances of RCRA standards were reported from the other sitewide samples.

5.2 GROUNDWATER

As described in Chapter 4, a total 26 monitoring wells were installed to characterize the groundwater at the Site; 18 shallow (bridging the water table) and eight (8) deep (approximately 55 to 65 feet bmsl). The results of the RI activities to address groundwater flow direction, tidal influence, hydraulic conductivity, and groundwater quality are discussed in the following subsections.

5.2.1 Groundwater Flow Direction

Six rounds of groundwater elevation measurements were recorded from the 26 monitoring wells at the Site: one on December 4, 2000; one on January 10, 2000; two on January 25, 2001; April 9, 2002, and September 23, 2002 (Table 4-2). It should be noted that only two rounds of groundwater measurements were recorded for MW-10D and MW-11D since they were installed in January 2002. Analysis of the results of the six rounds of data indicates little variability between events (the flow patterns observed in one round remain essentially unchanged in the others). Therefore, only one round (December 4, 2000) is graphically presented and discussed in this report. Based on the groundwater elevations recorded on December 4, 2000, two groundwater elevation contour maps were prepared; one for the measurements recorded from the shallow monitoring wells (Figure 4-10), and one for the measurements recorded from the deep monitoring wells (Figure 4-11). The discussion of each is presented below.

Shallow Monitoring Wells

The groundwater elevation contour map for the shallow monitoring wells indicates the presence of both a perched water table and the regional water table at the Site. The perched water table is observed on the eastern and southern portions of the Site. The area of this perched water table is consistent with the area of the Site underlain by the silts and clays of the Merchantville formation. In addition, perched water may also exist on the peat and organic soils (interpreted as alluvium) in the area of MW-16S and 16D near Hessian Run. The perched groundwater is at a higher elevation than the adjacent surface water, therefore, it is interpreted to discharge to these waters. Perched groundwater, by its nature, has a strong downward flow potential, so there may also be some seepage of the perched groundwater through the clays and silts of the Merchantville. The downward vertical gradient between MW-14S and MW-14D is approximately 0.37 ft/ft. The horizontal gradient in this same area is only about 0.005 ft/ft. The perched groundwater on the eastern portion of the Site flows towards Hessian Run. The remainder of the perched water flows to the regional water table, which is exposed in the northwestern portion of the Site. The regional water table is at a lower elevation than the surrounding surface waters, therefore, the surface waters are also interpreted to discharge to the regional groundwater.

Deep Monitoring Wells

The groundwater elevation contour map for the deep groundwater presents a simpler picture. This figure represents the groundwater elevation contours in the sands of the Magothy formation between elevation 55 and 65 bmsl. These contours indicate a horizontal flow in that zone towards the southeast under a horizontal gradient of approximately 0.003 ft/ft. This flow direction is consistent with regional data. As discussed earlier, this flow direction is attributable to inland pumping centers. The nearest influence is likely to be a West Deptford supply, located approximately 0.6 mile to the southeast. There is also a slight downward vertical gradient in the regional groundwater of approximately 0.005 ft/ft as documented between MW-18S (regional water table) and MW-18D (deep zone).

5.2.2 Tidal Influence

The tidal study was performed to determine the influence of tidal fluctuation of the surface water on the groundwater. The study included measurements recorded over a two week period from transducers placed at eight (8) locations; one (1) stream gauge in Woodbury Creek (SG-1), four (4) shallow monitoring wells (MW-9S, MW-10S, MW-11S, and MW-12S) and three (3) deep wells (MW-18D, MW-15D, and MW-14D). The numerical data from the transducers is presented in Appendix D. A graphical representation of the data is presented on Figure 5-3. The figure depicts a tidal range in Woodbury Creek of up to 8 feet between high and low tide, and demonstrates that the elevation of the Woodbury Creek is always higher than the regional groundwater, regardless of the tidal cycle. The influence of the tides on the groundwater is minimal. Even in the well with the most pronounced response (MW-18D), the 8-foot tidal range in the creek translates to only about 0.5-foot tidal range in the well. Fluctuations are observed in the well farthest from the surface water (MW-14D), but it is unclear as to whether this is related to the tides or to some other influence, such as pumping of supply wells.

5.2.3 Hydraulic Conductivity

As described in Chapter 4, rising head pump tests were performed on three (3) deep monitoring wells (MW-14D, MW-16D, and MW-17D). The test data and analyses are presented in Appendix F and the results are summarized in Table 5-17. The average horizontal hydraulic conductivity for the three tests is 13.6 ft/day, which is consistent with that expected for a medium to fine sand (Todd, 1980). Monitoring well MW-17D (11.9 ft/day) is screened in a combination of gravel, clay, and sand, while MW-16D (6.4 ft/day) and MW-14D (22.7 ft/day) are screened in a combination of fine and coarse to fine sand. Using the average horizontal hydraulic conductivity of 13.6 ft/day, the average horizontal gradient of 0.003 ft/ft (see 5.2.1 above), and an assumed effective porosity of 25 percent, the average horizontal seepage velocity of the groundwater in the 55 to 65 ft bmsl interval is approximately 0.16 feet/day or approximately 58 feet/year. Using the high and low horizontal hydraulic conductivity values recorded, the range of horizontal seepage velocity would be from approximately 29 ft/year to approximately 99 ft/year.

5.2.4 Groundwater Quality

Three rounds of groundwater sampling and analysis (Round 1: December 2000; Round 2: January 2001; and Round 3: April 2002) were performed to characterize the quality of the groundwater at the Site. The results of the Round 1 sampling event are summarized on Tables 5-18 through 5-20. The results of the Round 2 sampling event are summarized on Tables 5-21 and 5-22. The results of the Round 3 sampling event are summarized on Table 5-23. Additionally, two rounds of potable well samples were collected from PW-3 and are presented on Table 5-24. The analytical results were compared to the NJDEP Ground Water Quality Criteria N.J.A.C. 7:9-6 (GWQC) and New Jersey Drinking Water Standards (NJDWS). Exceedances of criteria are noted on the tables and illustrated on Figures 4-12 through 4-14. The first two rounds, groundwater from 26 wells were sampled and analyzed: 18 shallow monitoring wells; six (6) deep monitoring wells; and two (2) domestic potable wells. Based on previous sample information, the third round was limited to six deep monitoring wells (MW-10D, MW-11D, MW-14D, MW-15D, MW-16D, and MW-18D) and one potable well (PW-3), which was sampled twice. The results for each of these three groups of wells are discussed below.

Shallow Monitoring Wells

Inorganics (primarily aluminum, arsenic, iron, and manganese) were detected above GWQC in shallow monitoring wells throughout the Site. These detections are believed to be attributable to suspended sediments in the samples. Many of these detections were in unfiltered samples from conventional purge sampling conducted in the first event. These inorganics were greatly reduced in concentration, or not detected, in filtered samples from the same event. Low-flow purge was conducted at the second event and the inorganics results in the shallow monitoring wells throughout the Site showed primarily exceedances of groundwater quality standards (GWQS) for aluminum and iron. No samples were collected from the shallow monitoring wells during the third round of sampling.

However, there were several detections in the shallow groundwater wells that appear attributable to Site activities. The most significantly impacted is MW-5, a shallow monitoring well in the perched groundwater located in the northeastern portion of the Site, near Hessian Run. This well is very near buried waste and surface disposal areas. Elevated concentrations of lead are detected in unfiltered (6,050 ug/l), filtered (3,290 ug/l), and low-flow purge (1,320 ug/l) samples. MW-13S, located about 300 feet east of MW-5, had a small exceedance of cadmium in both the unfiltered (4.4J ug/l) and filtered (5.3 ug/l) samples from the first event, but this metal was not detected in the low-flow purge sample collected in the second event. Unusual results were observed for the low-flow purge sample collected during the second event from shallow monitoring well MW-8. Chromium (164 ug/l), lead (14.5 ug/l), and nickel (174 ug/l) were all detected above GWQS in this sample, but all were non-detect in both the unfiltered and filtered samples collected from the conventional purge of the first event. MW-8 is located in the center of the Site and is screened across the regional water table. This well could be affected by all surrounding areas of the Site. The regional water table flows towards it from the west, and perched water flows towards it from the south, east, and north. Additional data will be required to determine if these most recent results are anomalous.

Deep Monitoring Wells

As with the shallow monitoring wells, inorganics (primarily aluminum, arsenic, iron, and manganese) were detected above GWQC in the deep monitoring wells throughout the Site. As discussed above, these detections are interpreted to be unrelated to the Site activities. Unlike the shallow monitoring wells, however, vinyl chloride was detected above GWQC in three of the deep monitoring wells located in the central to southeastern portions of the Site in both events. vinyl chloride was detected in MW-14D (Round 1: 13 ug/l, Round 2: 17 ug/l, Round 3: 15 ug/l), MW-15D (Round 1: 8J ug/l, Round 2: 11 ug/l, Round 3: 7J ug/l), and MW-16D (Round 1: 6J ug/l, Round 2: 8J ug/l, Round 3: below criteria). In addition, bis (2-ethylhexyl phthalate) was detected in MW-15D (35 ug/l) in Round 1. Additionally, the two new deep upgradient monitoring wells (MW-10D and MW-11D) in the western part of the Site did not indicate the presence of vinyl chloride. The reduction in VOC levels may indicate a naturally attenuated degradation of these compounds over time, or possibly indicate that the dissolved VOCs have migrated eastward with groundwater flow.

Potable Wells

During this RI, two (2) rounds of sampling and analysis were performed for two (2) potable wells: the residential house well (PW-1), and the onsite Matteo well (PW-2), which supplied the Matteo office and garage buildings. The results are summarized on Tables 5-20 and 5-22, and are illustrated on Figures 4-12 and 4-13. In PW-1 only iron (680 ug/l and 1,700 ug/l, respectively) was detected above NJDWS. In PW-2, iron (27,400 ug/l and 26,900 ug/l, respectively) and manganese (270 ug/l and 260 ug/l, respectively) were detected above NJDWS. Historical data for the Matteo residential well (PW-2) contained an exceedance of lead in August 1994.

Based on the results of the well search, the adjacent Billy-O-Tire garage (PW-3) was sampled twice for VOCs and Metals. The results are summarized in Table 5-24. Both samples collected from the private off-site potable well (PW-3) indicated concentrations of vinyl chloride (3.5 ug/l and 4.8 ug/l), slightly above NJDWS (2 ug/l). Additionally, In PW-3, iron (18,200 ug/l and 18,500 ug/l, respectively) and manganese (170 ug/l and 170 ug/l, respectively) were detected above NJDWS, which is consistent with historical results from April 1998.

5.3 SEEPS

Samples of groundwater seeping from the shoreline were collected at ten (10) locations along Hessian Run and Woodbury Creek and analyzed for lead (unfiltered and filtered) and hardness. The locations of the ten samples are shown on Figure 4-12 and the results of the analyses are summarized on Table 5-25. The results of the lead analysis were compared to the GWQS (10 ug/l) as well as the NJDEP Surface Water Quality Standards N.J.A.C. 7:9B (SWQS; 2.5 ug/l ecological, and 5 ug/l human).

The results of all unfiltered samples exceeded the GWQS, with concentrations ranging from 29.1 ug/l (SP-2U) to 2,370 ug/l (SP-5U). Only three of the filtered samples exceeded the GWQS (SP-8F, SP-9F, and SP-10F), however, these were not from the same location as the three unfiltered

samples with the highest lead concentrations (SP-5, SP-6, and SP-3). The three filtered samples with concentrations of lead exceeding the GWQS are from areas filled with battery casings only (Figure 5-1).

With regard to the SWQS, all unfiltered samples are in exceedance of both the human and ecological criteria. Five filtered samples exceed both the human and ecological criteria, the three that exceed the GWQS (SP-8F, SP-9F, and SP-10F) as well as SP-3F and SP-6F.

5.4 SEDIMENT

As discussed in the previous Chapter, 416 sediment samples were collected from the Hessian Run and Woodbury Creek estuary surrounding the Site. The samples were collected at 145 locations distributed over 28 transects and 14 discrete locations from depths of 0-6 inches, 12-24 inches, and 24 to 36 inches. The samples were analyzed for lead and PCBs, as well as TOC, pH, and grain size. The lead and PCB results were compared to both the low effects level (LEL) and severe effects level (SEL) criteria presented in the NJDEP Guidance for Sediment Quality Evaluations (GSQE); the results are summarized on Tables 5-26 and 5-27.

Samples collected from the 0-6 inch interval at 29 of these locations (closest to the Site) were also analyzed for full TCL/TAL analysis; the results are summarized on Tables 5-28 and 5-29. In addition, samples collected from the 0-6 inch interval from 11 locations were analyzed for TCL PCBs and TAL metals. The results were compared to both the low effects level (LEL) and severe effects level (SEL) criteria presented in the NJDEP Guidance for Sediment Quality Evaluations (GSQE); the results are summarized on Tables 5-30 and 5-31. No volatile organic compounds or pesticides were detected above the LEL or SEL. One semi-volatile organic compound was detected only above the LEL (benzo (k) fluoranthene at 0.25J mg/kg in T15-EA). Seven metals (in addition to lead) were detected above the LEL (arsenic, cadmium, copper, mercury, nickel, silver, and zinc). Of these, only arsenic, copper, and zinc were detected above the SEL. The lead and PCB results for sediments are discussed in the following subsections.

5.4.1 Lead

The results of the lead analysis of the sediment samples are summarized in Table 5-26 and illustrated for each of the three depth intervals on Figures 4-15 through 4-17. The detected concentrations of lead exceeded the LEL criteria (31 mg/kg) at all three depths throughout the study area in the estuary. The SEL criteria (250 mg/kg) was also exceeded in all three depth intervals but, with the exception of one sample (S8-A at 269 mg/kg), the SEL exceedances are limited to the Hessian Run estuary. The highest concentrations of lead are detected along the central portion of the north shoreline of the Site. Concentrations over 15,000 mg/kg are detected in all three depth intervals, with the highest observed in the 12 to 24 inch depth interval (35,200 mg/kg at T13-EB and 25,200 mg/kg at T9-EB). These results are apparently attributable to the battery casings buried along this shoreline. In addition, exceedances of the SEL criteria are observed at all three depth intervals along the opposite shore of Hessian Run, north of the Site. The highest concentrations there are approximately two orders of magnitude lower than those observed along the Site shoreline. These results may be attributable to migration and re-deposition of the contamination from the Site via tidal flow. However, the possibility of

additional source(s) also exists. The historical aerial photos (Appendix A) show disturbance/landfilling on several properties, other than Matteo, surrounding the estuary study area.

5.4.2 PCBs

The results of the PCB analysis of the sediment samples are summarized in Table 5-27. Aroclors 1254, 1260, and 1248 were detected. The LEL and SEL criteria for PCBs is Aroclor-specific. Aroclor 1254 is the most prevalent and is, therefore, selected to show the extent of PCB contamination. The Aroclor 1254 analytical results are illustrated for each of the three depth intervals on Figures 4-18 through 4-20. The detected concentrations of Aroclor 1254 exceed the LEL criteria (0.06 mg/kg) at all three depths. The majority of the Hessian Run estuary is affected, with the exception of the central channel portions. In the Hessian Run estuary, the extent of LEL exceedance is greater in the top two feet of sediment than in the 24 to 36 inch interval. The converse is true in the Woodbury Creek estuary. Here the greatest extent of LEL exceedance is in the 24 to 36 inch interval. The SEL criteria (varies for each sample based on the TOC concentration) are only exceeded at three locations. Two of these locations, T9-EA (4.3 mg/kg) and T11-EA (3.2 mg/kg) are located along the central portion of the north shoreline of the Site. These are the highest concentrations of PCBs detected in the study area and are apparently attributable to past activities at the Site. The other SEL exceedance is located on the opposite shore of Hessian Run (T13-AA at 0.57 mg/kg), north of the Site. These results may be attributable to migration and re-deposition of the contamination from the Site via tidal flow. However, the possibility of additional source(s) also exists. The historical aerial photos (Appendix A) show disturbance/landfilling on several properties, other than Matteo, surrounding the estuary study area.

5.5 SURFACE WATER

Surface water samples were collected at 12 locations in Hessian Run and Woodbury Creek. The twelve locations are shown on Figure 4-9. At each location, two sampling events were conducted on the same day; one at high tide and one at low tide. At each of these events, both an unfiltered and a filtered sample were collected, for a total of 24 unfiltered samples and 24 filtered samples. The samples were analyzed for lead, hardness (excluding the filtered samples), salinity, pH, and dissolved oxygen. The results of the analyses are summarized on Table 5-32.

All lead results were compared to the NJDEP Surface Water Quality Standards N.J.A.C. 7:9B (SWQS; 2.5 ug/l ecological and 5 ug/l human). Most of the unfiltered samples exceed the SWQS ecological criteria (20 of 24 samples) and many (16 of 24 samples) exceed the SWQS human criteria with the highest concentration (87.4 ug/l) observed in the low tide sample at T-18D. In general, the unfiltered samples collected at low tide have higher concentrations than those collected at the same location at high tide (9 of 12 locations). Only two exceedances of the SWQS were observed in the 24 filtered samples. The ecological criteria is exceeded in the low tide sample at T-18C (2.6J ug/l) and both the ecological and human criteria are exceeded in the high tide sample at T-1C (6.1 ug/l).

5.6 NATURAL RESOURCES

The Site study area is a rectangular parcel of land, approximately 120 acres in size (Figure 1-1). The study area is comprised of forest and meadow habitats, extensive freshwater tidal wetlands, a metal recycling operation, a junkyard and an inactive landfill. The Site is bordered to the north by Hessian Run, to the west by Woodbury Creek and to the southeast by Route 130 and a residential area. Hessian Run and Woodbury Creek are tidally influenced freshwater rivers with associated tidal flats that flow to the Delaware River.

5.6.1 Vegetative Communities

Upland and wetland vegetative communities on the Site were classified in accordance with the Preliminary Natural Community Classification for New Jersey (Breden 1989). Wetland communities were also classified in accordance with Cowardin (1979). The upland and wetland communities are described more fully below. Table 5-33 presents a listing of the plant species observed at the Site and their respective indicator status (wetland-upland). Figure 5-4 shows the location of the different vegetative communities.

5.6.2 Uplands

The upland areas consisted of approximately 55 acres of forest, scrub/shrub and open fields within the Site. These areas dominated the majority of the Matteo Iron and Metal property. Prior land use includes agriculture, forest, landfills and commercial uses. Each of the communities exhibited evidence of past disturbance, including activities such as excavation, filling, and agriculture. Detailed descriptions of the upland vegetative communities on the Site are provided below and locations are shown on Figure 5-4.

Mesic Coastal Plain Mixed Oak Forest

This forest habitat type is found throughout the Site. Stand age varies with older growth, approximately 50-80 years, along the border of the Site where disturbance has been minimal. Younger stands composed of trees of 20 to 30 years old occupy areas of more recent disturbance and succession. Dominant vegetation in the forested areas included red oak, post oak, white oak and black cherry in the canopy. Multi-flora rose, blackberry and black birch dominate the shrub layer. A small area of mesic mixed oak forest with scrub pine was also identified.

Open Meadow, Prior Agricultural

The herbaceous (open meadow) habitat is found in the central portion of the Site and can be linked to the former agricultural practices on the Site. Dominant vegetation found in the herbaceous habitats included small white aster, grasses and mugwort.

5.6.3 Wetlands and Open Water Areas

Existing mapping was reviewed to determine the extent and classification of wetland areas prior to the field visit. The NJDEP Freshwater Wetland map (Figure 5-5) identifies four (4) wetland

cover types on the Site; palustrine emergent (PEM1), palustrine scrub shrub broad-leaved deciduous (PSS1), palustrine forested broad-leaved deciduous (PFO1) and palustrine open water (ROW). The NJDEP freshwater wetland maps typically do not map tidal wetland areas. The NWI Mapping (Figure 5-6) identifies three (3) wetland habitats in the study area: Riverine Tidal Emergent (R1EM), Riverine Tidal Open Water (R1OW) and Palustrine Scrub/Shrub Broad-leaved Deciduous Emergent (PSS1/EM).

Four (4) types of wetland habitat were observed and delineated within the Site during the field delineation. The wetland areas include riverine tidal emergent wetlands (R1EM), palustrine emergent, persistent wetlands (PEM1), palustrine forested broad-leaved deciduous wetlands (PFO1) and riverine tidal open water (R1OW) (see Figure 5-4, Wetland Delineation and Vegetative Community Map). A description of each wetland type is provided below along with the community classification per Breden (1989).

**Riverine Tidal Emergent Wetlands (R1EM) /
Freshwater Tidal Marsh Complex, Midtidal Zone**

The Woodbury Creek -Hessian Run waterbodies are associated with extensive freshwater tidal marshes. The tidal marshes are relatively flat and are regularly flooded by daily tides. These areas have been identified by the Atlantic Coast Ecological Inventory a part of the Delaware River Estuary. Dominant vegetation consists of nonpersistent plants including arrow arum, pickerelweed, and arrow-head. Portions of this area include mud flats and small channels that drain surface water at low tides. The substrate ranges from organic clays to silt loam.

**Palustrine Emergent, Persistent, Wetlands (PEM1)/
Freshwater Tidal Marsh Complex**

A portion of the delineated wetlands consists of persistent emergent vegetation that occupies a transition area between the uplands and/or forested wetlands and the broad freshwater tidal marshes of Hessian Run and the Woodbury Creek. Dominant vegetation consists of common reed, tussock sedge, and broad-leaved cattail. Red osier dogwood, Japanese honeysuckle, multiflora rose and northern arrowwood are present along the margins.

The substrate in the wetland ranged from organic clays to silt loam, having low chromas, gleying and mottling. The hydrology varied from saturated soils to flowing and ponded water. Other hydrologic indicators observed include drainage patterns, water marks on vegetation and water-stained vegetation.

**Palustrine Forested Wetland (PFO1)/
Forested/Nontidal Communities**

The southwestern portion of the Site contains a forested wetland that adjoins palustrine emergent wetlands outside the study area limits. Dominant vegetation consists of red maple, slippery elm, and nannyberry within the canopy and shrub layers. In addition, reed canary grass and tussock sedge occurs in a narrow transition area between the emergent wetland and the forested wetland. The soils in the wetland ranged from clay loam to silt loams, having low chromas and mottling. The observed wetland hydrology varied from saturated soils to surface inundation of several

inches. Other hydrologic indicators included drainage patterns, water marks on vegetation and water-stained vegetation.

Riverine Tidal Open Water (ROW)

Woodbury Creek and Hessian Run form the final wetland type of riverine open water. These wetlands occur on the edges of the Site areas where the freshwater tidal emergent wetlands transition into the creeks. Narrow mud flats exposed at low tide are included in this area.

5.6.4 Wildlife

The project Site likely provides habitat for a variety of wildlife species due to the diversity of habitat types and the sites location adjacent to an extensive freshwater tidal marsh. The most notable limiting factor was the amount of human activity on and surrounding the Site, including the junkyard, abandoned landfill and residential housing.

During the field survey, the most readily apparent wildlife consisted of birds utilizing the ecotone between the different vegetation types. Bird species observed on the Site are listed in Table 5-34. In addition to the species observed during the site visit, several additional avian species may utilize the Site as a potential breeding habitat and are listed in Table 5-35. Mammalian species observed during the field survey were eastern gray squirrel (*Sciurus carolinensis*), white-tail deer (*Odocoileus virginianus*), muskrat (*Ondatra zibethicus*) and cottontail rabbit (*Sylvilagus floridanus*). It is likely, however, that various other mammals common to New Jersey also utilize the Site.

Birds that were not seen on Site at the time of investigation, but would likely use the creeks and associated tidal flats and marsh include shorebirds, waterfowl and wading birds. Several wetland dependent bird species would utilize the wetland habitat during breeding season, but a greater number and diversity will most likely utilize the tidal marsh complex during migration periods for resting and feeding. Table 5-36 presents a list of potential bird species that could utilize the tidal marsh complex associated with Woodbury Creek and Hessian Run.

5.6.5 Fish

The Site is situated along tidally influenced Woodbury Creek and Hessian Run that support various freshwater and anadromous species. Hastings and Good (1977) reported information for a population analysis of fish within Woodbury Creek and Hessian Run. This study identified 17 species of fish (Table 5-37) at 12 sampling points within the creeks. The majority, 13 are primarily freshwater species, with the remainder being marine or anadromous species. Of these, five (5) species are game fish, including pumpkinseed, brown bullhead catfish, white perch, carp and black crappie.

5.6.6 Threatened and Endangered Species

No threatened or endangered species were observed during field investigations. NJDEP's Natural Heritage Program and the USFWS were contacted regarding documented occurrences of

threatened or endangered species on or within the vicinity of the Site. No documented occurrences of threatened or endangered species have been reported within the study area. Except for transient individuals, no threatened or endangered species are expected to utilize the Site.

5.7 WELL SEARCH

Data was obtained from the NJDEP and the Gloucester County Health Department regarding potential well locations in Site investigation area. Copies of well records, supplied by the NJDEP are included in Appendix H. A summary of potential residential potable well receptors within 1/2 mile of the Site, and municipal supply wells within one (1) mile is summarized on Table 5-38 and their locations are shown on Figure 5-7.

The well search performed at the NJDEP Bureau of Water Allocation did not identify two of the domestic wells sampled and analyzed during the RI. Berger contacted William Atkinson from the Gloucester County Health Department to obtain well information pertaining to Block 128, Lots 2 and 2.01, which were designated as PW-2 and PW-1 respectively, and sampled twice during the RI. The Gloucester County Health Department had no records of potable wells at those locations.

The well search did reveal a domestic well downgradient and adjacent to the Site, at the Billy-O-Tire Garage (Block 325, Lot 8). This well was designated as PW-3 and was also sampled twice during the RI. According to records, this well was installed in 1998 and is screened from 93 to 103 feet below ground surface (bgs).

Approximately 0.6 miles downgradient of the Site is the closest public supply well. Records show that this West Deptford supply well was installed in 1973 and is 356 feet deep, with a screened interval from approximately 346 to 356 feet bgs; this supply well screen depth is approximately 250 feet deeper than the deepest monitoring wells installed and sampled during the Matteo site RI.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.0 CONCLUSIONS AND RECOMMENDATIONS

This Section presents conclusions and recommendations based on the findings discussed in the previous chapter. The conclusions focus on the sources of contamination, interpreted contaminant migration pathways, and potential off-site receptors. These conclusions are supported by the data generated and evaluated during the RI, as well as information obtained in the background review. Based on these conclusions, several recommendations for remedial alternatives are presented.

6.1 SOURCES

The two primary contaminants identified at the Site are lead and PCBs. In addition, low levels of chlorinated solvents and arsenic above GWQS were detected in the groundwater, as well as other metals in soil and groundwater.

The lead contamination observed at the Site is believed to originate with automotive batteries. It is believed that these batteries were brought to the Site and stripped of their lead contents for a smelting operation. The empty casings were buried onsite. While lead may have been released to the environment during the past operations, it is the residual lead in these battery casings that is interpreted to be the ongoing source of the lead contamination observed at the Site. The lead contamination observed in the adjacent tidally influenced estuary, however, may not be solely attributable to the Site. The historical aerial photographs (Appendix A) show disturbance/landfilling on several properties, other than the Site, surrounding the estuary study area.

The source of the PCB contamination is less clear. There may have been a widespread application of a PCB-containing agent for dust and weed control on the unpaved roadways and lots that supported the scrapyards and past waste disposal operations. A PCB-containing material may also have been mixed in with the waste that was buried at the Site. The PCB concentration distribution does not point to a specific source area; at least some portions of the scrapyards and waste disposal areas seem to be affected. As with the lead contamination, it should be noted that the PCB contamination observed in the adjacent tidally influenced estuary, may not be solely attributable to the Site. As mentioned above, the historical aerial photographs (Appendix A) show disturbance/landfilling on several properties, other than the Site, surrounding the estuary study area, as well as the presence of a nearby petroleum refinery located along an upstream tributary of the Hessian Run.

The source of the chlorinated solvent contamination observed in the deep monitoring wells was not identified. Based on the locations where it was observed, and the measured horizontal flow direction of groundwater, the source may have entered the ground in the area of land disturbance seen on the 1975 aerial photograph (Appendix A), however no evidence of an ongoing, active on-site source of VOCs contributing to groundwater contamination was found during the extensive soil sampling and excavation investigations.

Site activities are expected to be a minor source, particularly in the Scrapyard Area, of other metals, such as aluminum, antimony, arsenic, beryllium, copper, manganese, and zinc, observed above criteria in the soils and/or groundwater. However, the majority of the metals are believed to be from a naturally occurring source associated with the geologic formations below the Site. Arsenic, which has been raised as a potential concern by the NJDEP, is known to naturally occur at relatively high levels in glauconitic geologic formations of the type present at Matteo (Dooley, 2001). There may also be an input of metals related to off-site activities.

6.2 PATHWAYS

The interpreted migration pathways for the lead, PCB, chlorinated solvent, and other metals contamination identified at the Site are discussed in the following subsections.

6.2.1 Lead

The lead contamination was introduced to the Site through the surface and subsurface disposal of lead-containing material, such as the automotive battery casings discussed above. The lead has migrated from these sources into natural media that is in direct contact with it. Along Hessian Run, the buried waste has affected soil, perched groundwater, sediment and surface water. The soil directly in contact with the waste is affected, but this condition does not extend very far out or down in the soil column. The perched water table is also in contact with the waste along Hessian Run, and has been impacted by lead. This affected perched water does not appear to have migrated downward. This affected groundwater has, however, discharged to the adjacent estuary. Migration of the lead contamination into the estuary has likely occurred in both a dissolved and suspended state in water through: subsurface discharge of perched groundwater; surface discharge of perched groundwater (seeps); and overland precipitation runoff. In addition, some of the waste is actually in the estuary, in direct contact with the sediments and, at high-tide, the surface waters of Hessian Run. Through the movements of the tidally influenced surface waters of Hessian Run, the lead contamination is distributed in the estuary.

6.2.2 PCBs

PCB contamination is observed ubiquitously in the soil at the Site. However, the extent of PCB contamination at the site was not fully determined due to the presence of waste material located along the northern and western portions of the property, as well as the presence of several small data gaps in soil delineation in the central part of the Site. PCBs, by their nature, tend to stay bound to soil particles. The compounds have a high organic partitioning coefficient which means they have an affinity to bond with material of high organic content. PCBs do not tend to dissolve in water, and therefore were not detected in any of the groundwater or surface water samples collected during the RI. The PCBs were detected, however, in the sediments of the estuary. The PCBs likely migrated into the estuary bound to soil particles that were transported primarily by overland precipitation runoff. In addition, it is possible that some of the PCBs were introduced directly to the sediments of the estuary. Through the movements of the tidally influenced surface waters of Hessian Run, the PCB contamination, bound to suspended sediments, is distributed in the estuary.

6.2.3 Chlorinated Solvents

Chlorinated solvents, primarily vinyl chloride, were detected in three of the deep monitoring wells at the Site (MW-14D, MW-15D, and MW-16D). Based on the deep groundwater results, it appears that the source of VOCs in groundwater was likely to have been located in the triangular area bordered by MW-10D on the west, MW-16D on the northeast and MW-15D on the southeast. Through precipitation infiltration, dissolved solvent likely migrated to the water table. The regional (as opposed to perched) water table appears to be the first water encountered in this area. The hydraulic gradients in this area are horizontally to the southeast (0.003 ft/ft) and vertically downward (0.005 ft/ft as measured between MW-18S and MW-18D). Under these gradients, the dissolved solvent likely migrated to the southeast and downward with the flow of the groundwater. Based on the low concentrations observed, it is unlikely that free-phase solvent (dense non-aqueous phase liquid [DNAPL]) is (or was) present. Based on the calculated average horizontal seepage velocity of approximately 58 feet/year (Subsection 5.2.3), it would take approximately 33 years for the groundwater at MW-10D to travel to the location of MW-14D (approximately 1,900 feet). Using the horizontal seepage velocities calculated from the high and low horizontal hydraulic conductivities recorded at the Site, it would take a range of 19 to 68 years for the groundwater to cover the 1,900 feet. Based on the knowledge of the Site history, as supported by the historical aerial photographs, it appears that the average horizontal seepage velocity of 58 feet/year is fairly accurate, as it places the time of solvent release around 1967. Of course, this assumes the dissolved solvent just reached MW-14D in 2000. In addition, this transport estimate is based only on groundwater seepage velocity, and does not consider other contaminant transport factors. However, the estimates drawn from the data collected support the likelihood that the dissolved solvents observed in the deep groundwater could have been released to the Site in the areas of land disturbance/landfilling that occurred during the 1960's and 1970's.

6.2.4 Other Metals

The various metal contamination may have been introduced to the Site through the surface and subsurface disposal of metal-containing material along Hessian Run or the collection of automobiles related to the junkyard that are visible in the historical aerial photographs, or from scrap metal activities that are still active. The metals may have migrated from these sources into natural media (soils and shallow groundwater) via direct contact or precipitation. Similar to the lead contamination but to a lesser extent, the degree of metals contamination within the soils seems limited to the upper five (5) feet bgs. The shallow water table is in contact with the contaminants, but does not appear to have migrated downward. Migration of the lead contamination into the estuary has likely occurred in both a dissolved and suspended state in water through: subsurface discharge of perched groundwater; surface discharge of perched groundwater (seeps); and overland precipitation runoff.

6.3 RECEPTORS

Exposure pathways to both humans and ecological receptors are present for the lead and PCB waste/soil contamination on-site and the sediments in the adjacent estuary. The dissolved

chlorinated solvents in the deep groundwater and other metals in soil and groundwater contamination are primarily a potential threat only to human receptors.

6.3.1 PCBs, Lead, and Other Metals

The site, zoned as Light Industrial (I-1) is undeveloped, with the exception of the metals recycling business (under the name "Matteo Iron and Metals") in the Scrapyard Area. However, there is no fence limiting access to the site, with the exception of a partial fence at the Scrapyard Area. Thus, humans on site, as trespassers that frequent the site from the residential area to the south, workers, or otherwise, have the potential of coming in contact with waste/soil contaminated with lead and PCBs above the NJDEP RDCSCC. Direct handling of the waste/soil, or inhalation/ingestion of dust would increase the potential exposure. The greatest potential for human exposure will likely occur during active remediation of the waste materials and contaminated soil, should such activity be implemented. In this case, proper health and safety procedures would be employed. In addition to exposures on site, there are also potential exposures associated with lead and PCB contamination in Hessian Run, which is classified as a freshwater, non-trout (FW-2 NT) waterway. With designated uses including both fishing and recreation, there may also be human health risks associated with ingestion of fish and direct contact with surface water if sediments are left unremediated.

With regard to ecological receptors, upland habitats within the study area include mesic coastal plain mixed oak forest, open meadow, and industrial/commercial land. Four (4) wetland habitat types and open water areas were identified, delineated and surveyed within the project Site, including: palustrine emergent wetlands (PEM1), palustrine forested wetlands (PFO1), riverine tidal emergent wetlands (RIEM) and riverine tidal open water wetlands (RIOW). The existing habitats provide diverse cover that supports a variety of bird and mammal species. Except for transient individuals, no threatened or endangered species are expected to utilize the Site.

The extensive freshwater tidal marsh associated with the adjacent Woodbury Creek and Hessian Run provides an important breeding and feeding area for wetland dependent bird species. Shorebird and waterfowl use of this tidal marsh complex is anticipated to be high during periods of migration. The aquatic system also supports a diverse fishery, including several game fish species. The value of these habitats is affected by the apparent contamination of the sediments from the past landfill activities. Shorebirds, waterfowl and certain fish species have the potential for exposure to contaminants within the marsh sediments through ingestion of aquatic organisms and sediments while feeding.

6.3.2 Chlorinated Solvents

The potential receptors of the dissolved chlorinated solvents in the deep groundwater are the domestic and public water supply wells located downgradient of the identified contamination. Three domestic wells are located near the site (Block 128, Lots 2 & 2.01, and Block 325, Lot 8) and these have been sampled and analyzed twice during this RI. The chlorinated solvents were detected above NJDWS at PW-3. The records show that PW-3 was installed in 1998 and is screened from 93 to 103 feet bgs. Approximately 0.6 miles downgradient of the Site is the closest public supply well. Records show that this West Deptford supply well was installed in

1973 and is 356 feet deep, with a screened interval from approximately 346 to 356 feet bgs; this supply well screen depth is approximately 250 feet deeper than the deepest monitoring wells installed and sampled during the Matteo site RI. This municipal well has no treatment for volatile organic compounds (VOCs), and no VOCs of concern have ever been detected in distribution system samples collected at the wellhouse.

6.4 RECOMMENDATIONS

As stated above, the primary contaminants of concern identified at the Site are lead and PCBs in soil and dissolved chlorinated solvents in deep groundwater; lead and PCBs have also dispersed into the sediments of the adjacent estuary. Based on historical aerial photographs, previous activities on other properties, as well as current and past industrial operations within the vicinity may have also contributed to the contamination identified in the estuary during this RI.

Based on our understanding of the nature, sources, and distribution of Site related contamination, it is recommended that further evaluation be conducted on viable remedial actions to eliminate or mitigate the negative impacts of apparent contaminant sources on Site media and potential human and ecological receptors. This evaluation of remedial actions should address, at a minimum, the PCB-contaminated soil located in the surface soils (approximately 23,200 cubic yards), PCB and metal-contaminated soil located in the scrapyard (approximately 41,500 cubic yards), and the buried waste located along the shorelines (approximately 80,000 cubic yards). If excavation and/or capping of contaminated soil and/or buried waste are selected as future remedial actions, then the RI sample results can be utilized as post excavation samples during removal/capping activities, however, additional post excavation samples may be required to fill data gaps at various locations where delineation was not completed or as required by the NJDEP technical regulations. If removal of the waste buried along Hessian Run and the western property line is selected as a remedial action, the previous shoreline (see 1940 aerial photographs in Appendix A and shown on Figure 5-1) could be restored to its original extents. Prior to implementation of remedial actions, however, further evaluation could be conducted on the aquatic biota in the estuary to determine the actual effects of the observed contamination on ecological receptors, and possibly determine the existence of sources other than those at the Site. Based on the results of this supplemental biota study, more appropriate remedial alternatives for the estuary and the impacts of Site contamination on its aquatic ecosystems could be developed and evaluated.

The Site is believed to be the source of the dissolved chlorinated solvents detected in the deep groundwater, however, since the downgradient extent of VOC contamination has not yet been determined, therefore additional downgradient delineation and groundwater monitoring is recommended in support of establishment of a Classification Exception Area/Well Restriction Area (CEA/WEA) for the Site. As such, four (4) additional monitoring wells are recommended to delineate the downgradient extent of the VOC plume. In addition to re-sampling and analysis of the three domestic potable wells and selected on-site monitoring wells, the newly installed four (4) proposed off-site monitoring wells should also be sampled. Based on the low VOC concentrations detected in the deep groundwater, and the size of the area where a potential release may have occurred, additional RI efforts to identify the release area(s) (which may no

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longer show exceedance) are not recommended. It is possible that the removal of buried waste will serve this purpose.

7.0 REFERENCES

7.0 REFERENCES

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TABLES

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
SS22	SS22B	E78043-11	1-1.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
SS22	SS22C		2-2.5	Immunoassay	HAND AUGER	10/10/2000
SS22	SS22D	E78671-1	3-3.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
22NE12	22NE12A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
22NE12	22NE12B	E79272-9	1-1.5	PCBs	HAND AUGER	10/24/2000
22NE6	22NE6B	E79272-11	1-1.5	PCBs	HAND AUGER	10/24/2000
22NW12	22NW12A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
22NW12	22NW12B	E79272-19	1-1.5	PCBs	HAND AUGER	10/24/2000
22NW18	22NW18A	E78373-8	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
22SE12	22SE12A	E78372-4	0-0.5	PCBs, Immunoassays	HAND AUGER	10/6/2000
22SE12	22SE12B	E78964-18	1-1.5	PCBs	HAND AUGER	10/19/2000
22SE12	22SE12C	E78964-19	2-2.5	PCBs	HAND AUGER	10/19/2000
22SE18	22SE18A	E78373-9	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
22SW12	22SW12A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
22SW12	22SW12B	E78964-20	1-1.5	PCBs	HAND AUGER	10/19/2000
22SW12	22SW12C	E78964-21	2-2.5	PCBs	HAND AUGER	10/19/2000
S22S6C	PCBDUP9	E79140-10	2-2.5	PCBs	HAND AUGER	10/20/2000
S22S30	S22S30A	E78373-17	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
S22E1	S22E1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S22E3	S22E3A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S22N12	S22N12A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S22N12	S22N12B	E79272-5	1-1.5	PCBs	HAND AUGER	10/24/2000
S22N15	S22N15A	E78266-8	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S22N18	S22N18A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22N18	S22N18D	E79272-3	3-3.5	PCBs	HAND AUGER	10/24/2000
S22N1	S22N1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S22N21	S22N21A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22N24	S22N24A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
S22N24	S22N24B		1-1.5	Immunoassay	HAND AUGER	10/12/2000
S22N24	S22N24C	E79272-1	2-2.5	PCBs	HAND AUGER	10/24/2000
S22N3	S22N3A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S22N6	S22N6A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
S22N6	S22N6B	E79272-7	1-1.5	PCBs	HAND AUGER	10/24/2000
S22N9	S22N9A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
S22NE6	S22NE6A	E78265-12	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S22NW6	S22NW6A	E78265-11	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S22S12A	S22S12A	E78266-3	0-0.5	PCBs, Immunoassays	HAND AUGER	10/4/2000
S22S12	S22S12B	E79140-6	1-1.5	PCBs	HAND AUGER	10/20/2000
S22S12	S22S12C	E79140-7	2-2.5	PCBs	HAND AUGER	10/20/2000
S22S15	S22S15A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22S18	S22S18A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22S18	S22S18B	E79140-4	1-1.5	PCBs	HAND AUGER	10/19/2000
S22S18	S22S18C	E79140-5	2-2.5	PCBs	HAND AUGER	10/19/2000
S22S1	S22S1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S22S21	S22S21A	E78265-10	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S22S3	S22S3A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S22S6	S22S6A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
S22S6	S22S6B	E79140-8	1-1.5	PCBs	HAND AUGER	10/20/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
S22S6	S22S6C	E79140-9	2-2.5	PCBs	HAND AUGER	10/20/2000
S22S9	S22S9A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
S22SE6	S22SE6A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22SE6	S22SE6B	E79140-2	1-1.5	PCBs	HAND AUGER	10/19/2000
S22SE6	S22SE6C	E79140-3	2-2.5	PCBs	HAND AUGER	10/19/2000
S22SW6	S22SW6A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22SW6	S22SW6B	E78964-22	1-1.5	PCBs	HAND AUGER	10/19/2000
S22SW6	S22SW6C	E79140-1	2-2.5	PCBs	HAND AUGER	10/19/2000
S22W12	S22W12A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S22W15	S22W15A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22W15	S22W15B		0-0.5	Immunoassay	HAND AUGER	10/12/2000
S22W15	S22W15C	E78964-12	2-2.5	PCBs	HAND AUGER	10/19/2000
S22W15	S22W15D	E78964-13	3-3.5	PCBs	HAND AUGER	10/19/2000
S22W18	S22W18A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22W1	S22W1A	E76840-1	0-0.5	PCBs, Immunoassays	HAND AUGER	9/14/2000
S22W21	S22W21A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S22W21	S22W21B	E78671-6	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
S22W3	S22W3A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S22W3	S22W3B	E78964-16	1-1.5	PCBs	HAND AUGER	10/19/2000
S22W3	S22W3C	E78964-17	2-2.5	PCBs	HAND AUGER	10/19/2000
S22W6	S22W6A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
S22W9	S22W9A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
S22W9	S22W9B	E78964-14	1-1.5	PCBs	HAND AUGER	10/19/2000
S22W9	S22W9C	E78964-15	2-2.5	PCBs	HAND AUGER	10/19/2000
S22W1	PCBDUP3	E76840-4	0-0.5	PCBs	HAND AUGER	9/14/2000
SS25	SS25B		1-1.5	Immunoassay	HAND AUGER	9/7/2000
SS25	SS25C	E76418-1	2-2.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S25E1	S25E1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S25E3	S25E3A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S25E5	S25E5A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S25E7	S25E7A	E76418-5	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
S25N1	S25N1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S25N3	S25N3A	E76419-20	0-0.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S25N7	S25N7A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S25N7	S25N7A	E78671-9	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
S25N9	S25N9A	E78266-5	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S25NE6	S25NE6A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S25NE6	S25NE6B		1-1.5	Immunoassay	HAND AUGER	10/11/2000
S25NE6	S25NE6C		2-2.5	Immunoassay	HAND AUGER	10/12/2000
S25NE6	S25NE6D	E79272-13	3-3.5	PCBs	HAND AUGER	10/24/2000
S25NE8	S25NE8A	E78266-6	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S25S10	S25S10A	E78266-10	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S25S1	S25S1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S25S3	S25S3A	E76419-21	0-0.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S25S8	S25S8A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S25S8	S25S8B	E78671-15	1-1.5	PCBs, Immunoassays	HAND AUGER	10/12/2000
S25SE0	S25SE0A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S25SE0	S25SE0B		1-1.5	Immunoassay	HAND AUGER	10/12/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
S25SE6	S25SE6A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S25SE6	S25SE6B		1-1.5	Immunoassay	HAND AUGER	10/12/2000
S25SE6	S25SE6C	E79140-19	2-2.5	PCBs	HAND AUGER	10/20/2000
S25SE6	S25SE6D	E79140-20	3-3.5	PCBs	HAND AUGER	10/20/2000
S25W1	S25W1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S25W4	S25W4A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S26NE6	PCBDUP8	E78671-10	1-1.5	PCBs	HAND AUGER	10/11/2000
S26E1	S26E1A	E76235-3	0-0.5	PCBs, Immunoassays	HAND AUGER	9/5/2000
S26E5	S26E5A	E76418-7	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
S26E7	S26E7A	E76418-9	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
S26N11	S26N11A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S26N13	S26N13A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S26N1	S26N1A	E76234-7	0-0.5	PCBs, Immunoassays	HAND AUGER	9/5/2000
S26N1	S26N1B		1-1.5	Immunoassay	HAND AUGER	9/6/2000
S26N1	S26N1C	E76419-22	2-2.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S26N2	S26N2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S26N2	S26N2B		1-1.5	Immunoassay	HAND AUGER	9/7/2000
S26N3	S26N3A	E76234-1	0-0.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S26NE0	S26NE0A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S26NE2	S26NE2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S26NE4	S26NE4A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S26NE6	S26NE6A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S26NE6	S26NE6B	E78671-8	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
S26NE9	S26NE9A	E78043-7	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
S26NW2	S26NW2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S26NW4	S26NW4A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S26NW4	S26NW4B		1-1.5	Immunoassay	HAND AUGER	10/11/2000
S26NW4	S26NW4C	E78671-12	2-2.5	PCBs, Immunoassays	HAND AUGER	10/12/2000
S26NW6	S26NW6A	E76418-13	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
26NW11	26NW11A	E78265-7	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S26S1	S26S1A	E76235-2	0-0.5	PCBs, Immunoassays	HAND AUGER	9/5/2000
S26W1	S26W1A		0-0.5	Immunoassay	HAND AUGER	9/5/2000
S26W1	S26W1B		1-1.5	Immunoassay	HAND AUGER	9/6/2000
S26W2	S26W2A	E76235-1	0-0.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
SS27	SS27C	E76235-7	2-2.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27E1	S27E1A	E76234-8	0-0.5	PCBs, Immunoassays	HAND AUGER	9/5/2000
S27E1	S27E1B	E76235-4	1-1.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27E2	S27E2A	E76235-6	0-0.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27N1	S27N1A		0-0.5	Immunoassay	HAND AUGER	9/5/2000
S27N1	S27N1B		1-1.5	Immunoassay	HAND AUGER	9/6/2000
S27N1	S27N1C	E76235-8	2-2.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27N2	S27N2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S27N2	S27N2B	E76418-4	1-1.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S27N2	PCBDUP2	E76418-2	1-1.5	PCBs	HAND AUGER	9/7/2000
S27N2	S27N2C		2-2.5	Immunoassay	HAND AUGER	9/8/2000
S27NE2	S27NE2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S27NW2	S27NW2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S27S0	S27S0A		0-0.5	Immunoassay	HAND AUGER	10/4/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
S27S12	S27S12A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S27S14	S27S14A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S27S14	S27S14B	E78671-5	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
S27S16	S27S16A	E78266-11	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S27S1	S27S1A		0-0.5	Immunoassay	HAND AUGER	9/5/2000
S27S1	S27S1B		1-1.5	Immunoassay	HAND AUGER	9/6/2000
S27S1	S27S1C	E76235-9	2-2.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27S2	S27S2A	E76235-5	0-0.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27S5	S27S5A	E76418-11	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
S27S7	S27S7A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S27S7	S27S7B	E78671-11	1-1.5	PCBs, Immunoassays	HAND AUGER	10/12/2000
S27SE3	S27SE3A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S27SE5	S27SE5A	E76418-12	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
27SE5	27SE5B	E79140-17	1-1.5	PCBs	HAND AUGER	10/20/2000
27SE5	27SE5C	E79140-18	2-2.5	PCBs	HAND AUGER	10/20/2000
S27SE7	S27SE7A	E76418-10	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
S27SW2	S27SW2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S27SW4	S27SW4A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S27SW6	S27SW6A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
27SW6	27SW6B	E79140-15	1-1.5	PCBs	HAND AUGER	10/20/2000
27SW6	27SW6C	E79140-16	2-2.5	PCBs	HAND AUGER	10/20/2000
S27W1	S27W1A		0-0.5	Immunoassay	HAND AUGER	9/5/2000
S27W1	S27W1B		1-1.5	Immunoassay	HAND AUGER	9/6/2000
S27W1	S27W1C	E76235-10	2-2.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27W2	S27W2A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
S27W2	S27W2B	E76235-11	1-1.5	PCBs, Immunoassays	HAND AUGER	9/6/2000
S27W3	S27W3A		0-0.5	Immunoassay	HAND AUGER	9/6/2000
SS28	SS28B		1-1.5	Immunoassay	HAND AUGER	9/7/2000
SS28	SS28C		2-2.5	Immunoassay	HAND AUGER	9/7/2000
S28E1	S28E1A	E76418-3	0-0.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S28E2	S28E2A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S28E2	S28E2B	E79272-17	1-1.5	PCBs	HAND AUGER	10/24/2000
S28N1	S28N1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S28N3	S28N3A	E76419-19	0-0.5	PCBs, Immunoassays	HAND AUGER	9/7/2000
S28N8	S28N8A	E78373-7	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
S28NW4	S28NW4A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S28NW4	S28NW4B	E78671-7	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
S28NW6	S28NW6A	E76418-6	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
S28S0	S28S0A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S28S12	S28S12A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S28S14	S28S14A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S28S14	S28S14B	E78671-4	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
S28S16	S28S16A	E78265-5	0-0.5	PCBs, Immunoassays	HAND AUGER	9/5/2000
S28S1	S28S1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S28S2	S28S2D		3-3.5	Immunoassay	HAND AUGER	9/8/2000
S28S3	S28S3A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S28S5	S28S5A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S28S7	S28S7A		0-0.5	Immunoassay	HAND AUGER	9/8/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
S28S7	S28S7B		1-1.5	Immunoassay	HAND AUGER	10/12/2000
S28S7	S28S7C	E79140-13	2-2.5	PCBs	HAND AUGER	10/20/2000
S28S7	S28S7D	E79140-14	3-3.5	PCBs	HAND AUGER	10/20/2000
S28SW0	S28SW0A		0-0.5	Immunoassay	HAND AUGER	10/4/2000
S28SW5	S28SW5A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S28SW7	S28SW7A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S28SW7	S28SW7B		1-1.5	Immunoassay	HAND AUGER	10/12/2000
S28SW7	S28SW7C	E79140-11	2-2.5	PCBs	HAND AUGER	10/20/2000
S28SW7	S28SW7D	E79140-12	3-3.5	PCBs	HAND AUGER	10/20/2000
28SW12	28SW12A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
28SW12	28SW12B	E78671-3	1-1.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
28SW12	28SW12C		2-2.5	Immunoassay	HAND AUGER	10/12/2000
28SW12	28SW12D	E79273-14	3-3.5	PCBs	HAND AUGER	10/24/2000
28SW14	28SW14A	E78266-9	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
28SW16	28SW16A	E78265-6	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
S28W1	S28W1A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S28W3	S28W3A		0-0.5	Immunoassay	HAND AUGER	9/7/2000
S28W5	S28W5A		0-0.5	Immunoassay	HAND AUGER	9/8/2000
S28W5	S28W5B	E79272-15	1-1.5	PCBs	HAND AUGER	10/24/2000
S28W7	S28W7A	E76418-8	0-0.5	PCBs, Immunoassays	HAND AUGER	9/8/2000
SS34	SS34B		1-1.5	Immunoassay	HAND AUGER	10/2/2000
SS34	SS34C	E78510-7	2-2.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
S34E12	S34E12A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
S34E12	S34E12B	E79274-1	1-1.5	PCBs	HAND AUGER	10/23/2000
S34E1	S34E1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S34E3	S34E3A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S34E6	S34E6A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S34E6	S34E6B	E79274-3	1-1.5	PCBs	HAND AUGER	10/23/2000
S34E9	S34E9A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
S34N1	S34N1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S34N3	S34N3A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
S34N3	S34N3B	E79274-7	1-1.5	PCBs	HAND AUGER	10/23/2000
S34N6	S34N6A	E78372-1	0-0.5	PCBs, Immunoassays	HAND AUGER	10/6/2000
S34NE6	S34NE6A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
S34NE6	S34NE6B	E79274-5	1-1.5	PCBs	HAND AUGER	10/23/2000
S34S1	S34S1A	E76840-3	0-0.5	PCBs, Immunoassays	HAND AUGER	9/14/2000
S34S6	S34S6A	E78510-3	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
S34SE15	S34SE15A	E78510-2	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
S34SE6	S34SE6A	E78372-2	0-0.5	PCBs, Immunoassays	HAND AUGER	10/6/2000
S34SE6	PCBDUP7	E78372-5	0-0.5	PCBs	HAND AUGER	10/6/2000
34SE12	34SE12A		0-0.5	Immunoassay	HAND AUGER	10/10/2000
34SE12	34SE12B	E79274-9	1-1.5	PCBs	HAND AUGER	10/23/2000
S34W1	S34W1A	E76840-2	0-0.5	PCBs, Immunoassays	HAND AUGER	9/14/2000
SS35	SS35B		1-1.5	Immunoassay	HAND AUGER	10/2/2000
SS35	SS35C	E78510-8	2-2.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
S35E1	S35E1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S35E1	S35E1B	E79273-4	1-1.5	PCBs	HAND AUGER	10/23/2000
S35E3	S35E3A	E77892-7	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
S35N1	S35N1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S35N1	S35N1B	E79274-11	1-1.5	PCBs	HAND AUGER	10/23/2000
S35N1	S35N1C	E79273-1	2-2.5	PCBs	HAND AUGER	10/23/2000
S35N3	S35N3A	E77892-5	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
S35S1	S35S1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S35S1	S35S1B	E79273-2	1-1.5	PCBs	HAND AUGER	10/23/2000
S35S3	S35S3A	E77892-6	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
S35SW1	S35SW1B	E79273-6	1-1.5	PCBs	HAND AUGER	10/23/2000
S35W1	S35W1A		0-0.5	Immunoassay	HAND AUGER	9/14/2000
S35W1	S35W1C	E79273-7	2-2.5	PCBs	HAND AUGER	10/23/2000
S35W3	S35W3A	E77892-4	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PCB 1	PCB 1A	E77893-2	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 2	PCB 2A	E77893-5	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 3	PCB 3A	E77893-4	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 4	PCB 4A	E77893-3	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 5	PCB 5A	E77893-6	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 6	PCB 6A	E77893-9	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 6	PCB DUP4	E77893-11	0-0.5	PCBs	HAND AUGER	9/28/2000
PCB 7	PCB 7A	E77893-10	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB8	PCB8A	E77892-3	0-0.5	PCBs, Immunoassays	HAND AUGER	10/29/2000
PCB 9	PCB 9A	E77893-7	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB 10	PCB 10A	E77893-1	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB11	PCB11A		0-0.5	Immunoassay	HAND AUGER	9/28/2000
PCB11	PCB11B		1-1.5	Immunoassay	HAND AUGER	10/2/2000
PCB11	PCB11C		2-2.5	Immunoassay	HAND AUGER	10/10/2000
PCB11	PCB11D	E78671-2	3-3.5	PCBs, Immunoassays	HAND AUGER	10/11/2000
P11NW3	P11NW3A	E78372-3	0-0.5	PCBs, Immunoassays	HAND AUGER	10/6/2000
PB11E1	PB11E1A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
PB11E1	PB11E1B	E79273-9	1-1.5	PCBs	HAND AUGER	10/24/2000
PB11E3	PB11E3A	E78043-5	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
PB11N1	PB11N1A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
PB11N1	PB11N1C	E79273-11	2-2.5	PCBs	HAND AUGER	10/24/2000
PB11S1	PB11S1A	E77893-15	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PB11S3	PB11S3A	E78043-4	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
PB11W1	PB11W1A	E77893-17	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PB11W1	PB11W1B	E79273-10	1-1.5	PCBs	HAND AUGER	10/24/2000
PB11W3	PB11W3A	E78266-7	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
P12NW6	P12NW6A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
P12SE2	P12SE2A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
P12SW6	P12SW6A		0-0.5	Immunoassay	HAND AUGER	10/5/2000
P12SW9	P12SW9A		0-0.5	Immunoassay	HAND AUGER	10/6/2000
PB12E1	PB12E1A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
PB12E3	PB12E3A	E78043-3	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
PB12N1	PB12N1A	E77892-9	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PB12N3	PB12N3A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
PB12S1	PB12S1A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
PB12S3	PB12S3A	E78043-10	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
PB12S6	PB12S6A	E78043-6	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
PCB SURFACE SOIL SAMPLES						
PB12W1	PB12W1A		0-0.5	Immunoassay	HAND AUGER	9/29/2000
PB12W3	PB12W3A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
PB12W6	PB12W6A	E78043-9	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
PB12W9	PB12W9A	E78266-2	0-0.5	PCBs, Immunoassays	HAND AUGER	10/4/2000
PB12W9	PCBDUP6	E78266-4	0-0.5	PCBs	HAND AUGER	10/4/2000
PB12N1	PCBDUP5	E77892-8	0-0.5	PCBs	HAND AUGER	9/29/2000
PCB12	PCB12A	E77893-8	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PCB12	PCB12B		1-1.5	Immunoassay	HAND AUGER	10/2/2000
PCB12	PCB12B		1-1.5	Immunoassay	HAND AUGER	10/2/2000
PCB12	PCB12C	E78510-6	2-2.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB12	PCB12D		3-3.5	Immunoassay	HAND AUGER	10/11/2000
PCB12	PCB12E		4-4.5	Immunoassay	HAND AUGER	10/12/2000
P13N3	P13N3B	E78510-4	1-1.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
P13N9	PCBDUP1	E76234-2	0-0.5	PCBs	HAND AUGER	9/6/2000
P13NE4	P13NE4A	E78265-8	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
P13NW6	P13NW6A	E78265-9	0-0.5	PCBs, Immunoassays	HAND AUGER	10/5/2000
PB13E1	PB13E1A	E77893-12	0-0.5	PCBs, Immunoassays	HAND AUGER	9/28/2000
PB13N1	PB13N1A	E77892-10	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PB13N3	PB13N3A		0-0.5	Immunoassay	HAND AUGER	10/2/2000
PB13N6	PB13N6A	E78043-8	0-0.5	PCBs, Immunoassays	HAND AUGER	10/2/2000
PB13S1	PB13S1A	E77893-14	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PB13W1	PB13W1A	E77893-13	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PCB13	PCB13A		0-0.5	Immunoassay	HAND AUGER	9/28/2000
PCB13	PCB13C	E78510-5	2-2.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB 14	PCB 14A	E77893-16	0-0.5	PCBs, Immunoassays	HAND AUGER	9/29/2000
PCB15	PCB15A	E78266-1	0-0.5	PCBs, Immunoassays	HAND AUGER	10/4/2000
PCB16	PCB16A		0-0.5	Immunoassay	HAND AUGER	10/10/2000
P16SE3	P16SE3A	E78510-1	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB17	PCB17A	E78373-10	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB18	PCB18A		0-0.5	Immunoassay	HAND AUGER	10/10/2000
P18SW3	P18SW3A	E78373-16	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB19	PCB19A	E78373-11	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB20	PCB20A	E78373-12	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB21	PCB21A	E78373-15	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB22	PCB22A	E78373-13	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000
PCB23	PCB23A	E78373-14	0-0.5	PCBs, Immunoassays	HAND AUGER	10/10/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
WELL BORING SAMPLES						
MW1	MW-1A	E77442-5	1.0-1.5	VOC, SVOC, PPCBs, Metals	SPLIT SPOON	9/25/2000
MW1	MW-1B	E77442-6	10-10.5	VOC, SVOC, PPCBs, Metals	SPLIT SPOON	9/25/2000
MW1	MW1C	E77442-7	14-16	TOC, pH	SPLIT SPOON	9/25/2000
MW2	MW-2A	E77159-15	12-14	TOC, pH, Grain Size	SPLIT SPOON	9/18/2000
MW3	MW-3A	E77159-16	10-12	TOC, pH, Grain Size	SPLIT SPOON	9/18/2000
MW4	MW-4A	E76949-15	8-9.5	TOC, pH, Grain Size	SPLIT SPOON	9/19/2000
MW5	MW-5A	E77159-17	12-14	TOC, pH, Grain Size	SPLIT SPOON	9/19/2000
MW6	MW-6DUP	E76949-17	8-10	TOC, pH, Grain Size	SPLIT SPOON	9/20/2000
MW6	MW-6A	E76949-16	8-10	TOC, pH, Grain Size	SPLIT SPOON	9/20/2000
MW7	MW-7A	E76949-18	8.5-10	TOC, pH, Grain Size	SPLIT SPOON	9/21/2000
MW8	MW8A	E77442-3	14-16	TOC, pH	SPLIT SPOON	9/25/2000
MW8	MW8B	E77442-4	16-18	TOC, pH	SPLIT SPOON	9/25/2000
MW9	MW-9A	E77442-1	10-12	TOC, pH, Grain Size	SPLIT SPOON	9/22/2000
MW10	MW-10A	E77442-2	10-12	TOC, pH, Grain Size	SPLIT SPOON	9/22/2000
MW11	MW-11A	E76949-19	6-8	TOC, pH, Grain Size	SPLIT SPOON	9/21/2000
MW12	MW-12A	E76949-20	6-8.5	TOC, pH, Grain Size	SPLIT SPOON	9/21/2000
B13	MW13A	E78510-17	6-7	TOC, pH, Grain Size	SPLIT SPOON	10/10/2000
B13	MW13B	E78510-18	12-13	TOC, pH, Grain Size	SPLIT SPOON	10/10/2000
B13	MW-13C	E78671-13	30-36.5	TOC, pH, Grain Size	SPLIT SPOON	10/13/2000
B13	MW-13D	E78671-14	55-60.5	TOC, pH, Grain Size	SPLIT SPOON	10/13/2000
B13	DUPTOC	E78963-10	85-86	TOC, pH	SPLIT SPOON	10/16/2000
B14	MW14-A	E77892-1	6-8	TOC, pH, Grain Size	SPLIT SPOON	9/29/2000
B14	MW14-B	E77892-2	18-20	TOC, pH, Grain Size	SPLIT SPOON	9/29/2000
B14	MW14-C	E78043-1	45-47	TOC, pH, Grain Size	SPLIT SPOON	10/2/2000
B14	MW14-D	E78043-2	75-77	TOC, pH, Grain Size	SPLIT SPOON	10/2/2000
B15	MW-15A	E78043-12	2-8	TOC, pH, Grain Size	SPLIT SPOON	10/3/2000
B15	MW-15B	E78043-13	8-12	TOC, pH, Grain Size	SPLIT SPOON	10/3/2000
B15	MW-15C	E78043-14	25-32	TOC, pH, Grain Size	SPLIT SPOON	10/3/2000
B15	MW-15E	E78043-15	45-52	TOC, pH, Grain Size	SPLIT SPOON	10/3/2000
B15	MW15-E	E78265-1	80-87	TOC, pH, Grain Size	SPLIT SPOON	10/5/2000
B16	MW16C	E78265-4	10-11.5	TOC, pH, Grain Size	SPLIT SPOON	10/5/2000
B16	MW16D	E78266-12	45-46	TOC, pH, Grain Size	SPLIT SPOON	10/6/2000
B16	MW16E	E78266-13	50-51	TOC, pH, Grain Size	SPLIT SPOON	10/6/2000
B16	MW16F	E78266-14	60-61	TOC, pH, Grain Size	SPLIT SPOON	10/6/2000
B16	MW16G	E78510-9	85-86	TOC, pH	SPLIT SPOON	10/9/2000
B16	MW16H	E78510-10	90-91	TOC, pH	SPLIT SPOON	10/9/2000
B17	MW17D-A	E76840-5	4-5.5	TOC, pH, Grain Size	SPLIT SPOON	9/14/2000
B17	MW17D-B	E76840-6	9-10.5	TOC, pH, Grain Size	SPLIT SPOON	9/14/2000
B17	MW17D-C	E76840-7	18-19	TOC, pH, Grain Size	SPLIT SPOON	9/14/2000
B17	MW17D-D	E76840-8	45-46	TOC, pH, Grain Size	SPLIT SPOON	9/14/2000
B17	MW17D-E	E76840-9	65-66	TOC, pH, Grain Size	SPLIT SPOON	9/14/2000
B17	MW17D-F	E76840-10	75-76	TOC, pH, Grain Size	SPLIT SPOON	9/14/2000
B17	MW17D-G	E76949-2	85-86	TOC, pH, Grain Size	SPLIT SPOON	9/15/2000
B18	MW18C	E78510-13	6-7	TOC, pH, Grain Size	SPLIT SPOON	10/10/2000
B18	MW18D	E78510-14	16-17	TOC, pH, Grain Size	SPLIT SPOON	10/10/2000
B18	MW18E	E78510-15	25-26	TOC, pH, Grain Size	SPLIT SPOON	10/10/2000
B18	MW18F	E78510-16	50-51	TOC, pH, Grain Size	SPLIT SPOON	10/10/2000
B16	MW16A	E78265-2	2-2.5	VOC, SVOC, PPCBs, Metals	SPLIT SPOON	10/5/2000
B16	MW16B	E78265-2	6.5-7	VOC, SVOC, PPCBs, Metals	SPLIT SPOON	10/5/2000
B18	MW-18A	E78510-11	3-4	VOC, SVOC, PPCBs, Metals	SPLIT SPOON	10/10/2000
B18	MW-18B	E78510-12	5-6	VOC, SVOC, PPCBs, Metals	SPLIT SPOON	10/10/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SCRAPYARD AREA GEOPROBE/HAND AUGER BORING SAMPLES (0 - 2 ft.)						
HA-1	HA-1A	N1314-12	0 - 0.5	PEST and PCB	HAND AUGER	10/23/2001
HA-1	GPDUP2	N1313-11	0 - 0.5	PEST and PCB	HAND AUGER	10/23/2001
HA-2	HA-2A	N1529-1	0 - 0.5	PEST, PCB, and Metals	HAND AUGER	10/26/2001
HA-3	HA-3A	N1529-3	0 - 0.5	PEST, PCB, and Metals	HAND AUGER	10/26/2001
HA-4A	HA 4A	N12323-1	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-5A	HA 5A	N12323-3	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-6A	HA 6A	N12323-5	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-7A	HA 7A	N12323-7	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-8A	HA 8A	N12323-9	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-8B	HA 8B	N16274-9	0 - 0.5	PCB	HAND AUGER	6/14/2002
HA-9A	HA 9A	N12323-11	0 - 0.5	PCB	GEOPROBE	4/11/2002
HA-10A	HA 10A	N12323-13	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-10B	HA 10B	N16274-7	0 - 0.5	PCB	HAND AUGER	6/14/2002
HA-11A	HA 11A	N12323-15	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-12A	HA 12A	N12323-17	0 - 0.5	PCB	HAND AUGER	4/11/2002
HA-12B	HA 12B	N16274-7	0 - 0.5	PCB	HAND AUGER	6/14/2002
HA-13A	HA 13A	N12323-19	0 - 0.5	PCB	HAND AUGER	4/11/2002
GP-1	GP-01A	E76579-1	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-2	GP-02A	E76579-3	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-3	GP-03A	E76579-5	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-4	GP-04A	E76579-7	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-5	GP-05A	E76579-9	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-6	GP-06A	E76579-12	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-7	GP-07A	E76579-13	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-8	GP-08A	E76579-16	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-9	GP-09A	E76579-17	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-10	GP-10A	E76579-19	0 - 0.5	PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-13	GP-13A	N1314-5	0 - 0.5	PEST and PCB	GEOPROBE	10/23/2001
GP-18	GP-18A	N1315-9	0 - 0.5	PEST and PCB	GEOPROBE	10/23/2001
GP-21	GP-21A	N1313-7	0 - 0.5	PEST and PCB	GEOPROBE	10/23/2001
GP-22	GP-22A	N1314-14	0 - 0.5	PEST, PCB, and Metals	GEOPROBE	10/23/2001
GP-27	GP-27A	N1405-13	0 - 0.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-28	GP-28A	N1405-15	0 - 0.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-30	GP-30A	N1409-1	0 - 0.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-12	GP-12A	N1314-2	0 - 1	PEST and PCB	GEOPROBE	10/23/2001
GP-12	GPDUP1	N1313-10	0 - 1	PEST and PCB	GEOPROBE	10/23/2001
GP-14	GP-14A	N1314-8	0.3 - 0.8	PEST and PCB	GEOPROBE	10/23/2001
GP-15	GP-15A	N1314-11	0.3 - 0.8	PEST and PCB	GEOPROBE	10/23/2001
GP-16	GP-16A	N1315-3	0.3 - 0.8	PEST and PCB	GEOPROBE	10/23/2001
GP-23	GP-23A	N1405-1	0.3 - 0.8	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-31	GP-31A	N1409-4	0.3 - 0.8	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-31	GP-DUP4	N1409-8	0.3 - 0.8	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-17	GP-17A	N1315-6	0.5 - 1	PEST and PCB	GEOPROBE	10/23/2001
GP-19	GP-19A	N1313-1	0.5 - 1	PEST and PCB	GEOPROBE	10/23/2001
GP-20	GP-20A	N1313-4	0.5 - 1	PEST and PCB	GEOPROBE	10/23/2001
GP-24	GP-24A	N1405-4	0.5 - 1	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-25	GP-25A	N1405-7	0.5 - 1	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-32	GP 32A	N12323-24	0.5 - 1	PCB and Metals	GEOPROBE	4/11/2002
GP-33	GP 33A	N12323-26	0.5 - 1	PCB and Metals	GEOPROBE	4/11/2002
GP-5	GP 5C	N12323-21	1.5 - 2	PCB, and Metals	GEOPROBE	4/11/2002
GP-7	GP-7C	N12322-6	1.5 - 2	PCB, and Metals	GEOPROBE	4/11/2002

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SCRAPYARD AREA GEOPROBE/HAND AUGER BORING SAMPLES (0 - 2 ft.)						
GP-7	DUPE 02	N12323-30	1.5 - 2	PCB, and Metals	GEOPROBE	4/11/2002
GP-12	GP 12D	N12322-8	1.5 - 2	PCB and Metals	GEOPROBE	4/11/2002
GP-14	GP 14D	N12322-10	1.5 - 2	PCB and Metals	GEOPROBE	4/11/2002
GP-24	GP 24D	N12322-12	1.5 - 2	PCB and Metals	GEOPROBE	4/11/2002
GP-25	GP 25D	N12322-14	1.5 - 2	PCB and Metals	GEOPROBE	4/11/2002
GP-29	GP-29A	N1405-18	1 - 1.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-29	GP-DUP3	N1409-7	1 - 1.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-30	GP 30D	N12322-16	1.5 - 2	PCB and Metals	GEOPROBE	4/11/2002
GP-32	GP 32B	N16274-6	1.5 - 2	Metals	HAND AUGER	6/14/2002
GP-32	DUPE 01	N12323-29	1.5 - 2	PCB and Metals	GEOPROBE	4/11/2002
GP-33	GP 33B	N16274-3	1.5 - 2	PCB and Metals	HAND AUGER	6/14/2002
GP-26	GP-26A	N1405-10	1.5 - 2	PEST, PCB, and Metals	HAND AUGER	10/24/2001
SCRAPYARD AREA GEOPROBE/HAND AUGER BORING SAMPLES (2 - 4 ft.)						
GP-7	GP-7D	N16274-4	2.5 - 3	Metals	HAND AUGER	6/14/2002
GP-12	GP 12E	N16274-2	2.5 - 3	PCB and Metals	HAND AUGER	6/14/2002
GP-12	DUP	N16274-10	2.5 - 3	PCB and Metals	HAND AUGER	6/14/2002
GP-14	GP 14E	N16274-1	2.5 - 3	PCB and Metals	HAND AUGER	6/14/2002
GP-30	GP 30E	N16274-5	2.5 - 3	PCB and Metals	HAND AUGER	6/14/2002
HA-1	HA-1B	N1314-13	3.5 - 4	PEST and PCB	HAND AUGER	10/23/2001
HA-2	HA-2B	N1529-2	3.5 - 4	PEST, PCB, and Metals	HAND AUGER	10/26/2001
HA-3	HA-3B	N1529-4	3.5 - 4	PEST, PCB, and Metals	HAND AUGER	10/26/2001
GP-11	GP-11B	N1314-1	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-12	GP-12B	N1314-3	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-13	GP-13B	N1314-6	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-14	GP-14B	N1314-9	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-15	GP-15B	N1315-1	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-16	GP-16B	N1315-4	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-17	GP-17B	N1315-7	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-18	GP-18B	N1315-10	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-19	GP-19B	N1313-2	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-20	GP-20B	N1313-5	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-21	GP-21B	N1313-8	3.5 - 4	PEST and PCB	GEOPROBE	10/23/2001
GP-22	GP-22B	N1314-15	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/23/2001
GP-23	GP-23B	N1405-2	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-24	GP-24B	N1405-5	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-25	GP-25B	N1405-8	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-26	GP-26B	N1405-11	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-27	GP-27B	N1405-14	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-28	GP-28B	N1405-16	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-29	GP-29B	N1405-19	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-30	GP-30B	N1409-2	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-31	GP-31B	N1409-5	3.5 - 4	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-29	GP-29C	N1405-20	5.5 - 6	PEST, PCB, and Metals	GEOPROBE	10/24/2001

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SCRAPYARD AREA GEOPROBE/HAND AUGER BORING SAMPLES (~10 - 12 ft.)						
GP-25	GP-25C	N1405-9	5 - 5.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-28	GP-28C	N1405-17	7.5 - 8	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-24	GP-24C	N1405-6	9.5 - 10	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-26	GP-26C	N1405-12	10 - 10.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-1	GP-01B	E70304-13	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-2	GP-02B	E76579-4	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-3	GP-03B	E76579-5	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-4	GP-04B	E76579-8	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-5	GP-05B	E76579-9	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-6	GP-06B	E76579-12	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-7	GP-07B	E76579-14	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-8	GP-08B	E76579-16	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-9	GP-09B	E76579-18	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-10	GP-10B	E76579-20	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-10	GP-11A	E76579-21	11 - 11.5	VOC, SVOC, PPCBs, Metals, pH	GEOPROBE	9/11/2000
GP-15	GP-15C	N1315-2	11 - 11.5	PEST and PCB	GEOPROBE	10/23/2001
GP-19	GP-19C	N1313-3	11 - 11.5	PEST and PCB	GEOPROBE	10/23/2001
GP-20	GP-20C	N1313-6	11 - 11.5	PEST and PCB	GEOPROBE	10/23/2001
GP-22	GP-22C	N1314-16	11 - 11.5	PEST, PCB, and Metals	GEOPROBE	10/23/2001
GP-34	GP-34	N12323-28	11 - 11.5	PCB and Metals	GEOPROBE	4/11/2002
GP-12	GP-12C	N1314-4	11.5 - 12	PEST and PCB	GEOPROBE	10/23/2001
GP-13	GP-13C	N1314-7	11.5 - 12	PEST and PCB	GEOPROBE	10/23/2001
GP-14	GP-14C	N1314-10	11.5 - 12	PEST and PCB	GEOPROBE	10/23/2001
GP-16	GP-16C	N1315-5	11.5 - 12	PEST and PCB	GEOPROBE	10/23/2001
GP-18	GP-18C	N1315-11	11.5 - 12	PEST and PCB	GEOPROBE	10/23/2001
GP-21	GP-21C	N1313-9	11.5 - 12	PEST and PCB	GEOPROBE	10/23/2001
GP-30	GP-30C	N1409-3	11.5 - 12	PEST, PCB, and Metals	GEOPROBE	10/24/2001
GP-17	GP-17C	N1315-8	12 - 12.5	PEST and PCB	GEOPROBE	10/23/2001
GP-23	GP-23C	N1405-3	12 - 12.5	PEST, PCB, and Metals	GEOPROBE	10/24/2001
TEST PIT SAMPLES						
TP1A	TP-1A	E76234-3	1.5-2	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/6/2000
TP1B	TP-1B	E76234-4	6-6.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/6/2000
TP1B	TP-1B/DUP1	E76234-6	6-6.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/6/2000
TP1C	TP-1C	E76234-5	2.5-3	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/6/2000
TP2A	TP-2A	E76419-11	3-3.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/7/2000
TP2A	TP-2B	E76419-12	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP2A	TP-2C	E76419-13	7-7.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP3A	TP-3A	E76419-14	1.5-2	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP3B	TP-3B	E76419-15	4.5-5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP4A	TP-4A	E76419-16	2-2.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP4B	TP-4B	E76419-17	2-2.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP4C	TP-4C	E76419-18	5.5-6	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP4C	TP-4D	E76418-14	13-14	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/7/2000
TP5A	TP-5A	E76419-8	2.5-3	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/8/2000
TP5A	TP-5A/DUP2	E76419-9	2.5-3	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/8/2000
TP6A	TP-6A	E76419-6	6-6.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/8/2000
TP6A	TPDUP3	E76419-10	6-6.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/8/2000
TP6A	TP-6B	E76419-7	11-11.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/8/2000
TP6B	TP-6C	E76419-5	2-2.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/8/2000
TP6B	TP-6D	E76949-14	1-1.5	VOC, METALS	SS SPOON	9/15/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
TEST PIT SAMPLES						
TP7A	TP-7A	E76419-3	10-11	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/8/2000
TP7A	TP-7B	E76419-4	1.5-2	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/8/2000
TP8A	TP-8A	E76419-2	8-8.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/8/2000
TP9A	TP-9A	E76419-1	7.5-8	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/8/2000
TP10A	TP-10A	E76571-1	12-12.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP11A	TP-11A	E76571-2	2-2.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP13A	TP-13A	E76571-3	9.5-10	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP14A	TP-14A	E76571-4	6.5-7	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP15	TP-15A	E76571-5	9-9.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP16	TP-16A	E76571-6	10.5-11	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP17	TP-17A	E76571-7	6-6.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/11/2000
TP18	TP-18	E76651-1	8-8.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/12/2000
TP19	TP-19	E76651-2	6.5-7	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP20	TP-20	E76651-3	8.5-9	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP21	TP-21	E76651-4	11.5-12	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP22	TP-22	E76651-5	13.5-14	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP23	TP-23	E76651-6	13-13.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP24	TP-24	E76651-7	8-8.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP25	TP-25	E76651-8	2-2.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/12/2000
TP26	TP-26	E76651-9	8.5-9	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/12/2000
TP27	TP-27A	E76651-10	1.5-2	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP27	TP-27B	E76651-11	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP28	TP-28A	E76651-12	2-2.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP28	TP-28B	E76651-13	3.5-4	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP28	TP-28C	E76651-14	0-0.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/13/2000
TP29	TP-29	E76651-15	9.5-10	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/13/2000
TP30	TP-30	E76651-16	11.5-12	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP31	TP-31	E76651-17	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP32	TP-32	E76651-18	1.5-2	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/13/2000
TP34	TP-34	E76651-19	2-2.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/13/2000
TP35	TP-35	E76651-20	5-5.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/13/2000
TP35	TP-DUP4	E76839-1	5-5.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/14/2001
TP36	TP-36A	E76839-2	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP36	TP-36B	E76839-3	12.5-13	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP37	TP-37	E76839-4	12.5-13	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP38	TP-38	E76839-5	4-4.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP39	TP-39	E76839-6	9.8-10	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP40	TP-40	E76839-7	9-9.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP41	TP-41	E76839-8	6-6.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP42	TP-42A	E76839-9	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP42	TP-42B	E76839-10	8.5-9	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP43	TP-43	E76839-11	12.5-13	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/14/2000
TP44	TP-44	E7689-12	2-2.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/14/2000
TP45	TP-45A	E76839-13	1.5-2	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/14/2000
TP45	TP-45B	E76839-14	2-2.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/14/2000
TP46	TP-46	E76949-3	14.5-15	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/15/2000
TP46	TP-46/DUP5	E76949-4	14.5-15	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/15/2000
TP47	TP-47	E76949-5	12.5-13	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/15/2000
TP48	TP-48A	E76949-6	1-1.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/15/2000
TP48	TP-48B	E76949-7	8.5-9	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/15/2000
TP49	TP-49	E76949-8	1-1.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/15/2000

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
TEST PIT SAMPLES						
TP50	TP-50A	E76949-9	1-1.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/15/2000
TP50	TP-50B	E76949-10	13.5-14	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/15/2000
TP51	TP-51A	E77159-1	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/18/2000
TP51	TP-51B	E77159-3	12.5-13	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/18/2000
TP51	TP-51/DUP6	E77159-2	3-3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/18/2000
TP52	TP-52	E77159-4	4-4.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/18/2000
TP53	TP-53	E77159-5	12.5-13	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/18/2000
TP54	TP-54	E77159-6	14.5-15	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/18/2000
TP55	TP-55	E77159-7	7.5-8	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/18/2000
TP56	TP-56A	E77159-8	2-2.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	9/18/2000
TP56	TP-56B	E77159-9	12-12.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	9/18/2000
TP-60	TP-60A	N1241-1	1.5 - 2	SVOC, PPCB, METALS, pH	SS SPOON	10/22/2001
TP-61	TP-61A	N1241-2	1 - 1.5	SVOC, PPCB, METALS, pH	SS SPOON	10/22/2001
TP-61	TP-61B	N1241-3	6 - 6.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/22/2001
TP-62	TP-62A	N1241-4	0.3 - 0.8	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/22/2001
TP-64	TP-64A	N1312-2	9 - 10	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/23/2001
TP-64	TP-64B	N1312-1	9 - 10	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/23/2001
TP-65	TP-65A	N1312-3	4 - 4.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/23/2001
TP-67	TP-67A	N1312-4	3 - 3.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/23/2001
TP-67	DUP-A	N1312-6	3 - 3.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/23/2001
TP-68	TP-68A	N1312-5	3 - 3.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/23/2001
TP-70	TP-70A	N1315-12	4.5 - 5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/24/2001
TP-71	TP-71A	N1315-13	6 - 6.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/24/2001
TP-71	DUP-2	N1315-17	6 - 6.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/24/2001
TP-72	TP-72A	N1315-14	4 - 4.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/24/2001
TP-73	TP-73A	N1315-15	8 - 8.5	Petroleum Hydrocarbons, Lead, Ph	SS SPOON	10/24/2001
TP-74	TP-74A	N1315-16	7 - 7.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/24/2001
TP-78	TP-78A	N1409-9	8 - 8.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001
TP-78	TP-78B	N1409-10	5 - 5.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001
TP-79	TP-79A	N1409-11	7 - 7.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001
TP-81	TP-81A	N1409-12	3 - 3.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001
TP-81	TP-81B	N1409-13	3.5 - 4	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001
TP-81	TP-81C	N1409-14	7 - 7.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001
TP-84	TP-84A	N1409-15	5 - 5.5	VOC, SVOC, PPCB, METALS, pH	SS SPOON	10/25/2001

Table 4-1
Matteo Iron and Metal
Soil Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SURFACE SOIL SAMPLES						
TPSS-A1	TPSS-A1	E76949-11	0-0.5	Lead, TPHC, pH	SS SPOON	9/15/2000
TPSS-A2	TPSS-A2	E76949-1	3.5-4.5	Lead, TPHC, pH	SS SPOON	9/15/2000
TPSS-B1	TPSS-B1	E76949-12	0-0.5	Lead, TPHC, pH	SS SPOON	9/15/2000
TPSS-C1	TPSS-C1	E76949-13	0-0.5	Lead, TPHC, pH	SS SPOON	9/15/2000
TPSS-F	TPSS-F1	E77159-12	0-0.5	Lead, TPHC, pH	SS SPOON	9/19/2000
TPSS-G	TPSS-G1	E77159-13	0-0.5	Lead, TPHC, pH	SS SPOON	9/19/2000
TPSS-H	TPSS-H1	E77159-14	0-0.5	Lead, TPHC, pH	SS SPOON	9/19/2000
TPSS-D	TPSS-D1	E77159-10	0-0.5	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	9/19/2000
TPSS-E	TPSS-E1	E77159-11	0-0.5	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	9/19/2000
TPSS-I	TPSS-DUP	E78373-6	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	10/6/2000
TPSS-I	TPSS-I1	E78373-1	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	10/6/2000
TPSS-J	TPSS-J1	E78373-2	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	10/6/2000
TPSS-K	TPSS-K1	E78373-3	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	10/6/2000
TPSS-L	TPSS-L1	E78373-4	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	10/6/2000
TPSS-M	TPSS-M1	E78373-5	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	10/6/2000
FULL-1	FULL-1	E81503-2	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	11/28/2000
FULL-2	FULL-2	E81503-3	0.5-0.8	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	11/28/2000
FULL-3	FULL-3	E81503-4	1	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	11/28/2000
FULL-3	FULL-DUP	E81503-7	1	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	11/28/2000
FULL-4	FULL-4	E81503-5	0.5-1	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	11/28/2000
FULL-5	FULL-5	E81503-6	0.5-1	VOC, SVOC, PPCBs, Metals, pH	SS SPOON	11/28/2000
SOIL CLASSIFICATION SAMPLES						
T-1	T-1	N12322-1	0 - 1	Full TCLP	SS SPOON	4/11/2002
T-2	T-2	N12322-2	0 - 1	Full TCLP	SS SPOON	4/11/2002
T-3	T-3	N12322-3	0 - 1	Full TCLP	SS SPOON	4/11/2002
T-4	T-4	N12322-4	0 - 1	Full TCLP	SS SPOON	4/11/2002
T-5	T-5	N12322-5	0 - 1	Full TCLP	SS SPOON	4/11/2002

TABLE
Matteo Iron Metal
Groundwater Elevation Measurements

Well Number	Well Construction Data				December 4, 2000			January 10, 2000			January 25, 2001		
	Top of Casing Elevation	Ground Elevation	Top of Screen Elevation	Bottom of Screen Elevation	Depth to Water (Below TOC)	PID (ppm)	Ground water Elevation	Depth to Water (Below TOC)	PID (ppm)	Ground water Elevation	Depth to Water (Below TOC)	PID (ppm)	Ground water Elevation
MW-01	19.96	20.86	12.86	2.86									
MW-02	21.09	18.25	13.39	3.39	11.41	0.0	8.55	11.54	N/S	8.42	11.30	N/S	8.66
MW-03	18.67	16.14	11.97	1.97	12.49	0.0	8.60	11.90	N/S	9.19	11.75	0	9.34
MW-04	15.27	12.72	10.23	0.23	12.17	0.0	6.50	11.64	N/S	7.03	11.53	0	7.14
MW-05	14.57	11.73	7.77	-2.23	11.05	0.0	4.22	10.64	N/S	4.63	10.51	0.5	4.76
MW-06	7.92	5.68	2.96	-7.04	8.31	0.0	-0.39	10.98	N/S	3.59	10.48	0.1	4.09
MW-07	12.63	10.35	5.88	-4.12	9.11	0.0	3.52	8.02	N/S	-0.10	6.84	0.1	1.08
MW-08	9.63	6.72	-3.28	-13.28	19.4	0.0	-9.77	8.78	N/S	3.85	7.85	0.1	4.78
MW-09	-6.57	4.05	-0.15	-10.15	13.24	0.0	-6.67	19.35	N/S	-9.72	19.24	0.2	-9.61
MW-10	5.80	3.40	-1.15	-11.15	12.28	0.0	-6.48	13.61	N/S	-7.04	13.45	0.2	-6.88
MW-10D*	6.01	3.42	-54.71	-64.71				12.7	N/S	-6.90	12.45	0.2	-6.65
MW-11	6.13	3.43	1.18	-8.82	11.75	0.0	-5.62	12.06	N/S	-5.93	11.96	0.2	-5.83
MW-11D*	5.76	3.21	-52.95	-62.95									
MW-12	5.56	3.73	0.60	-9.40	11.27	0.1	-5.71	11.77	N/S	-6.21	11.51	0.2	-5.95
MW-13S	13.73	11.67	6.17	-3.83	9.61	0.0	4.12	9.53	N/S	4.20	9.06	0	4.67
MW-13D	14.23	11.83	-54.67	-64.67	25.15	0.0	-10.92	24.99	N/S	-10.76	24.79	0.2	-10.56
MW-14S	24.08	22.12	9.12	-0.88	14.47	0.1	9.61	14.4	N/S	9.68	14.30	0	9.78
MW-14D	24.19	22.11	-51.89	-61.89	37.17	0.0	-12.98	36.83	N/S	-12.64	36.67	0.2	-12.48
MW-15S	6.53	3.92	1.92	-8.08	10.15	0.0	-3.62	9.86	N/S	-3.33	9.12	0.2	-2.59
MW-15D	5.99	3.79	-54.21	-64.21	15.37	0.0	-9.38	15.39	N/S	-9.40	15.24	0.2	-9.25
MW-16S	6.93	4.47	2.47	-7.53	7.06	0.6	-0.13	7.07	N/S	-0.14	6.68	0.3	0.25
MW-16D	6.67	4.89	-55.11	-65.11	15.27	0.0	-8.60	15.33	N/S	-8.66	15.22	0.5	-8.55
MW-17S	7.04	4.14	-1.06	-11.06	6.45	0.0	0.59	7.23	N/S	-0.19	6.63	0.2	0.41
MW-17D	6.87	4.40	-55.60	-65.60	14.86	0.0	-7.99	14.96	N/S	-8.09	14.89	0.2	-8.02
MW-18S	5.79	3.33	1.33	-8.67	10.98	0.0	-5.19	11.32	N/S	-5.53	11.22	0.1	-5.43
MW-18D	5.73	3.44	-55.56	-65.56	11.23	0.1	-5.50	11.51	N/S	-5.78	11.38	0.2	-5.65

Notes:
 All elevations are measured in feet according to mean sea
 All depths to water are measured in feet below the top of well casing.
 PID = Photoionization Detector
 N/S = Not Screened
 * = New Well construction - no previous data

TABLE
Matteo Iron Metal
Groundwater Elevation Measurements

Well Construction Data					January 25, 2001			April 9, 2002			October 23, 2002		
Well Number	Top of Casing Elevation	Ground Elevation	Top of Screen Elevation	Bottom of Screen Elevation	Depth to Water (Below TOC)	PID (ppm)	Ground water Elevation	Depth to Water (Below TOC)	PID (ppm)	Ground water Elevation	Depth to Water (Below TOC)	PID (ppm)	Ground water Elevation
MW-01	19.96	20.86	12.86	2.86	11.30	N/S	8.66	12.92	<1	7.04	13.95	<1	6.01
MW-02	21.09	18.25	13.39	3.39	11.71	0	9.38	15.32	<1	5.77	16.77	0	4.32
MW-03	18.67	16.14	11.97	1.97	11.51	0	7.16	15.30	<1	3.37	16.11	0	2.56
MW-04	15.27	12.72	10.23	0.23	10.47	0.5	4.80	14.25	<1	1.02	14.91	0	0.36
MW-05	14.57	11.73	7.77	-2.23	10.31	0.1	4.26	12.50	<1	2.07	12.79	0	1.78
MW-06	7.92	5.68	2.96	-7.04	6.75	0.1	1.17	7.78	<1	0.14	7.41	0	0.51
MW-07	12.63	10.35	5.88	-4.12	7.82	0.1	4.81	11.83	<1	0.80	15.67	0	-3.04
MW-08	9.63	6.72	-3.28	-13.28	19.22	0.2	-9.59	20.06	<1	-10.43	20.45	0	-10.82
MW-09	6.57	4.05	-0.15	-10.15	13.31	0.2	-6.74	14.35	<1	-7.78	12.88	0	-6.31
MW-10	5.80	3.40	-1.15	-11.15	12.40	0.2	-6.60	13.41	<1	-7.61	12.02	0	-6.22
MW-10D*	6.01	3.42	-54.71	-64.71				13.81	<1	-7.80	12.82	0	-6.81
MW-11	6.13	3.43	1.18	-8.82	11.91	0.2	-5.78	12.81	<1	-6.68	10.89	0	-4.76
MW-11D*	5.76	3.21	-52.95	-62.95				13.36	<1	-7.60	12.45	0	-6.69
MW-12	5.56	3.73	0.60	-9.40	11.39	0.2	-5.83	12.35	<1	-6.79	9.90	0	-4.34
MW-13S	13.73	11.67	6.17	-3.83	9.05	0	4.68	10.82	<1	2.91	12.01	0	1.72
MW-13D	14.23	11.83	-54.67	-64.67	24.80	0.2	-10.57	25.77	<1	-11.54	26.63	0	-12.40
MW-14S	24.08	22.12	9.12	-0.88	14.30	0	9.78	18.20	<1	5.88	21.30	0	2.78
MW-14D	24.19	22.11	-51.89	-61.89	36.59	0.2	-12.40	37.58	<1	-13.39	38.54	0	-14.35
MW-15S	6.53	3.92	1.92	-8.08	9.11	0.2	-2.58	9.71	<1	-3.18	11.15	0	-4.62
MW-15D	5.99	3.79	-54.21	-64.21	15.18	0.2	-9.19	16.24	<1	-10.25	16.28	0	-10.29
MW-16S	6.93	4.47	2.47	-7.53	6.69	0.3	0.24	6.64	<1	0.29	6.63	0	0.30
MW-16D	6.67	4.89	-55.11	-65.11	15.25	0.5	-8.58	16.22	<1	-9.55	16.05	0	-9.38
MW-17S	7.04	4.14	-1.06	-11.06	6.68	0.2	0.36	6.67	<1	0.37	5.59	0	1.45
MW-17D	6.87	4.40	-55.60	-65.60	14.73	0.2	-7.86	15.78	<1	-8.91	15.30	0	-8.43
MW-18S	5.79	3.33	1.33	-8.67	11.11	0.1	-5.32	12.02	<1	-6.23	10.14	0	-4.35
MW-18D	5.73	3.44	-55.56	-65.56	11.31	0.2	-5.58	12.2	<1	-6.47	10.83	0	-5.10

Notes:

All elevations are measured in feet according to mean sea

All depths to water are measured in feet below the top of well casing.

PID = Photoionization Detector

N/S = Not Screened

* = New Well construction - no previous data

Table 4-3
Manteo Iron and Metal
Water Sample Summary Table

Location	Sample ID	Lab ID	Analytical Parameters	Sampling Method	Date
SEEP SAMPLES					
SEEP-1	SP-1F	E80831-9	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-1	SP-1U	E80831-8	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-2	SP-2F	E80831-11	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-2	SP-2U	E80831-10	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-3	SP-3F	E80831-13	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-3	SP-3U	E80831-12	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-4	SP-4F	E80831-15	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-4	SP-4U	E80831-14	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-5	SP-5F	E80831-17	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-5	SP-5U	E80831-16	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-6	SP-6F	E81101-11	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-6	SP-6U	E81101-10	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-7	SP-7F	E81101-13	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-7	SP-7U	E81101-12	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-8	SP-8F	E81101-15	Lead (Filtered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-8	SP-8U	E81101-14	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/16/2000
SEEP-9	SP-9F	E81101-17	Lead (Filtered), Hardness	GRAB SAMPLE	11/17/2000
SEEP-9	SP-9U	E81101-16	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/17/2000
SEEP-9	SP-9U - SP DUP-1	E81101-1	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/17/2000
SEEP-10	SP-10F	E81101-19	Lead (Filtered), Hardness	GRAB SAMPLE	11/17/2000
SEEP-10	SP-10U	E81101-18	Lead (Unfiltered), Hardness	GRAB SAMPLE	11/17/2000
SURFACE WATER SAMPLES					
T1-C	T1-CHF	E81101-7	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-C	T1-CHU	E81101-6	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-C	T1-CLF	E81101-9	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-C	T1-CLU	E81101-8	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-D	T1-DHF	E81101-5	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-D	T1-DHU	E81101-4	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-D	T1-DLF	E81101-3	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T1-D	T1-DLU	E81101-2	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T3-C	T3-CHF	E80831-1	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T3-C	T3-CHU	E80830-10	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/17/2000
T3-C	T3-CLF	E80830-7	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T3-C	T3-CLU	E80830-6	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T3-D	T3-DHF	E80831-3	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T3-D	T3-DHU	E80831-2	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T3-D	T3-DLF	E80830-9	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T3-D	T3-DLU	E80830-8	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T3-D	T3-DHU - SWDUP-3	E80831-4	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T9C	T9CHF	E80583-18	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T9C	T9CHU	E80583-19	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T9C	T9-CLF	E80722-3	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/10/2000
T9C	T9-CLU	E80722-4	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/10/2000
T9D	T9DHF	E80583-16	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T9D	T9DHU	E80583-17	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T9-D	T9-DLF	E80722-1	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/10/2000
T9-D	T9-DLU	E80722-2	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/10/2000
T18-C	T18-CHF	E80722-16	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T18-C	T18-CHU	E80722-15	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T18-C	T18-CLF	E80830-2	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/14/2000
T18-C	T18-CLU	E80830-1	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/14/2000
T18-C	T18-CLU - SWDUP-2	E80830-3	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T18-D	T18-DHF	E80722-14	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T18-D	T18-DHU	E80722-13	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T18-D	T18-DLF	E80830-5	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/14/2000
T18-D	T18-DLU	E80830-4	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/14/2000
T25C	T25CHF	E80583-4	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T25C	T25CHU	E80583-5	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/15/2000
T25C	T25CHH	E80583-6	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25C	T25CLF	E80583-10	Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
			Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000

Table 4-3
Matteo Iron and Metal
Water Sample Summary Table

Location	Sample ID	Lab ID	Analytical Parameters	Sampling Method	Date
SURFACE WATER SAMPLES					
T25C	T25CLU	E80583-11	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25C	T25CLH	E80583-12	Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25C	T25CHF - TDUPF1	E80583-13	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25C	T25CHH - TDUPH1	E80583-15	Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25C	T25CHU - TDUPU1	E80583-14	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25D	T25DHF	E80583-1	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25D	T25DHU	E80583-2	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25D	T25DHH	E80583-3	Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25D	T25DLF	E80583-7	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25D	T25DLU	E80583-8	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T25D	T25DLH	E80583-9	Hardness, Salinity, pH, DO	GRAB SAMPLE	11/9/2000
T30-B	T30-BHU	E80722-11	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T30-B	T30-BLF	E80722-8	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T30-B	T30-BLU	E80722-7	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T30-C	T30-CHF	E80722-9	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T30-C	T30-CHU	E80722-10	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T30-C	T30-CLF	E80722-6	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T30-C	T30-CLU	E80722-5	Lead (Unfiltered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
T90-B	T90-BHF	E80722-12	Lead (Filtered), Hardness, Salinity, pH, DO	GRAB SAMPLE	11/13/2000
MONITORING WELL SAMPLES (Round 1)					
MW-1	MW-01	E82056-41	METALS (Filtered)	TEFLON BAILER	12/8/2000
MW-2	MW-02	E81966-17	METALS (Filtered)	TEFLON BAILER	12/5/2000
MW-3	MW-03	E82056-36	METALS (Filtered)	TEFLON BAILER	12/8/2000
MW-4	MW-04	E82056-38	METALS (Filtered)	TEFLON BAILER	12/8/2000
MW-5	MW-05	E82056-21	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-6	MW-06	E82056-24	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-7	MW-07	E81966-16	METALS (Filtered)	TEFLON BAILER	12/5/2000
MW-8	MW-08	E82056-23	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-9	MW-09	E82056-12	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-10	MW-10	E82056-11	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-11	MW-11	E82056-10	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-12	MW-12	E82056-13	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-13S	MW-13D	E82056-25	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-13D	MW-13S	E82056-26	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-14S	MW-14D	E81966-11	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-14D	MW-14S	E81966-12	METALS (Filtered)	TEFLON BAILER	12/4/2000
MW-15S	MW-15D	E82056-22	METALS (Filtered)	TEFLON BAILER	12/4/2000
MW-15D	MW-15S	E82056-21	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-16S	MW-16D	E82056-39	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-16D	MW-16S	E82056-40	METALS (Filtered)	TEFLON BAILER	12/8/2000
MW-17S	MW-17D	E81966-14	METALS (Filtered)	TEFLON BAILER	12/8/2000
MW-17D	MW-17S	E81966-13	METALS (Filtered)	TEFLON BAILER	12/5/2000
MW-18S	MW-18D	E82056-9	METALS (Filtered)	TEFLON BAILER	12/5/2000
MW-18D	MW-18S	E82056-8	METALS (Filtered)	TEFLON BAILER	12/6/2000
MW-1	MW-01	E82056-33	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-2	MW-02	E81966-17	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/8/2000
MW-3	MW-03	E82056-27	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/5/2000
MW-4	MW-04	E82056-30	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/8/2000
MW-5	MW-05	E82056-28	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/8/2000
MW-6	MW-06	E82056-17	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/8/2000
MW-7	MW-07	E81966-8	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/7/2000
MW-8	MW-08	E82056-16	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/5/2000
MW-9	MW-09	E82056-5	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/7/2000
MW-10	MW-10	E82056-4	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-11	MW-11	E82056-3	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-12	MW-12	E82056-6	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-13S	MW-13D	E82056-18	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-13D	MW-13S	E82056-19	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-14S	MW-14D	E81966-1	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
MW-14D	MW-14S	E81966-2	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/4/2000
MW-15S	MW-15D	E82056-15	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/4/2000
MW-15D	MW-15S	E82056-14	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/7/2000
MW-16S	MW-16D	E82056-31	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/7/2000
MW-16D	MW-16S	E82056-32	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/8/2000
MW-17S	MW-17D	E81966-5	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/8/2000
MW-17D	MW-17S	E81966-4	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/5/2000
MW-18S	MW-18D	E82056-2	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/5/2000
MW-18D	MW-18S	E82056-1	VOC, SVOC, PPCB, METALS (Unfiltered), CN	TEFLON BAILER	12/6/2000
PW-1	HOUWELL	E81965-2	VOC, SVOC, PPCB, METALS (Unfiltered)	TEFLON BAILER	12/6/2000
PW-1	PWDUP-1	E81965-3	VOC, SVOC, PPCB, METALS (Unfiltered)	GRAB SAMPLE	12/5/2000
PW-2	MIMWELL	E81965-1	VOC, SVOC, PPCB, METALS (Unfiltered)	GRAB SAMPLE	12/5/2000
			VOC, SVOC, PPCB, METALS (Unfiltered)	GRAB SAMPLE	12/4/2000

Table 4-3
Matteo Iron and Metal
Water Sample Summary Table

Location	Sample ID	Lab ID	Analytical Parameters	Sampling Method	Date
MONITORING WELL SAMPLES (Round 2)					
MW-1	MW-01	E85211-11	VOC, SVOC, PPCB, METALS		
MW-2	MW-02	E84957-1	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/1/2001
MW-3	MW-03	E85211-3	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/26/2001
MW-4	MW-04	E85211-6	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/1/2001
MW-5	MW-05	E84958-12	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/1/2001
MW-6	MW-06	E84958-13	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-7	MW-07	E85211-5	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-8	MW-08	E85211-12	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/1/2001
MW-9	MW-09	E84957-5	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/2/2001
MW-10	MW-10	E84957-6	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/26/2001
MW-11	MW-11	E85211-8	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/26/2001
MW-12	MW-12	E85211-1	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-13S	MW-13S	E84958-5	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/1/2001
MW-13D	MW-13D	E84958-6	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/29/2001
MW-14S	MW-14S	E84958-8	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/29/2001
MW-14D	MW-14D	E84958-7	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/29/2001
MW-15S	MW-15S	E84958-15	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-15D	MW-15D	E84958-16	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-16S	MW-16S	E84958-9	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/30/2001
MW-16D	MW-16D	E85211-4	VOC, SVOC, PPCB, METALS	TEFLON TUBING	2/1/2001
MW-17S	MW-17S	E84958-17	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-17D	MW-17D	E84958-18	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/31/2001
MW-18S	MW-18S	E84958-3	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/26/2001
MW-18D	MW-18D	E84958-4	VOC, SVOC, PPCB, METALS	TEFLON TUBING	1/26/2001
PW-1	PW-1	E84958-1A	VOC, SVOC, PPCB, METALS	GRAB SAMPLE	1/26/2001
PW-1	PWDUP-1	E84957-4A	VOC, SVOC, PPCB, METALS	GRAB SAMPLE	1/26/2001
PW-2	PW-2	E84957-2A	VOC, SVOC, PPCB, METALS	GRAB SAMPLE	1/26/2001
MONITORING WELL SAMPLES (Round 3)					
MW-10D	MW-10D	N12137-4	VOC and Metals (unfiltered)	TEFLON BAILER	4/9/2002
MW-11D	MW-11D	N12137-6	VOC and Metals (unfiltered)	TEFLON BAILER	4/10/2002
MW-14D	MW-14D	N12137-1	VOC and Metals (unfiltered)	TEFLON BAILER	4/9/2002
MW-14D	GW DUPE	N12137-9	VOC and Metals (unfiltered)	TEFLON BAILER	4/9/2002
MW-15D	MW-15D	N12137-2	VOC and Metals (unfiltered)	TEFLON BAILER	4/9/2002
MW-16D	MW-16D	N12137-5	VOC and Metals (unfiltered)	TEFLON BAILER	4/10/2002
MW-18D	MW-18D	N12137-3	VOC and Metals (unfiltered)	TEFLON BAILER	4/9/2002
POTABLE WELL SAMPLES					
Location	Sample ID	Lab ID	Analytical Parameters	Sampling Method	Date Collected
PW-3	PW-3	N2393 - 1	VOC and Metals	SPIGOT	11/8/2001
PW-3	PW-3	N1485 - 1	VOC and Metals	SPIGOT	10/25/2001

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
S6	S6	E80721-5	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/14/2000
S7	S7-B	E81170-20	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S7	S7-C	E81104-17	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S8	S8-B	E81170-17	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S8	S8-C	E81170-18	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S9	S9-B	E81170-14	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S9	S9-C	E81170-15	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S10	S10-B	E81170-11	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S10	S10-C	E81170-12	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S11	S11-B	E81170-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S11	S11-C	E81170-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S12	S12-B	E81170-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S12	S12-C	E81170-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S13	S13-B	E81170-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S13	S13-C	E81170-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
T1-A	T1-AB	E81104-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
T1-A	T1-AC	E81104-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-B	T1-BB	E81104-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-B	T1-BC	E81104-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-C	T1-CB	E81104-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-C	T1-CC	E81104-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-D	T1-DB	E81104-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-D	T1-DC	E81104-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T1-E	T1-EB	E81104-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T2-A	T2-AB	E79744-14	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/16/2000
T2-A	T2-AC	E79744-15	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T2-B	T2-BC	E79744-12	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T2-C	T2-CB	E79745-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T2-D	T2-DB	E79745-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T2-E	T2-EB	E79745-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T2-E	T2-EC	E79745-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T3-A	T3-AB	E80832-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T3-A	T3-AC	E80832-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-B	T3-BB	E80832-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-B	T3-BC	E80832-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-C	T3-CB	E80833-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-D	T3-DB	E80831-6	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-D	T3-DC	E80831-7	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-E	T3-EB	E80832-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T3-E	T3-EC	E80832-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T4-C	T4-CB	E79744-17	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T4-D	T4-DB	E79744-21	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T4-D	T4-DC	E79744-22	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T4-E	T4-EB	E79744-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T4-E	T4-EC	E79744-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T5-C	T5-CB	E79743-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T5-C	T5-CC	E79743-10	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T5-D	T5-DB	E79743-6	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T5-D	T5-DC	E79743-7	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T5-E	T5-EB	E79743-3	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T5-E	T5-EC	E79743-4	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T6-C	T6-CB	E79744-11	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T6-C	T6-CC	E79743-1	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T6-D	T6-DB	E79744-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T6-E	T6-EB	E79744-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T6-E	T6-EC	E79744-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T7-C	T7-CB	E79745-14	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T7-C	T7-CC	E79745-15	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T7-D	T7-DB	E79745-17	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T7-D	T7-DC	E79745-18	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T7-E	T7-EB	E79743-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T8-C	T8-CB	E79743-21	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T8-C	T8-CC	E79743-22	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T8-D	T8-DB	E79743-18	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T8-D	T8-DC	E79743-19	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T8-E	T8-EB	E79743-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T9-A	T9-AA	E80555-7	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T9-A	TDUP-17	E80555-10	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-A	T9-AB	E80555-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-A	T9-AC	E80555-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-B	T9-BB	E80555-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-B	T9-BC	E80555-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-C	T9-CA	E80555-4	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-C	T9-CB	E80555-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-C	T9-CC	E80555-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-D	T9-DA	E80555-1	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-D	T9-DB	E80555-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-D	T9-DC	E80555-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-E	T9-EB	E80555-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T9-E	T9-EC	E80555-16	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T10-C	T10-CA	E79933-1	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/10/2000
T11-A	T11-AB	E79555-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T11-A	T11-AC	E79555-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-B	T11-BB	E79555-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-B	T11-BC	E79555-16	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-C	T11-CB	E79555-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-C	T11-CC	E79555-10	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-D	T11-DB	E79555-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-D	T11-DC	E79555-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-E	T11-EB	E79555-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T13-A	T13-AC	E79453-5	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T13-B	T13-BB	E79453-1	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/25/2000
T13-B	T13-BC	E79453-2	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/25/2000
T13-C	T13-CB	E79452-16	1-2	PCB, Lead, pH, TOC	SED SAMPLER	10/25/2000
T13-D	T13-DA	E79452-18	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	10/25/2000
T13-D	T13-DC	E79452-20	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/25/2000
T13-E	T13-EC	E79452-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	10/25/2000
T17-A	T17-AB	E79931-17	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-B	T17-BB	E79931-14	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-B	T17-BC	E79931-15	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-C	T17-CB	E79932-7	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-C	T17-CC	E79932-8	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-D	T17-DB	E79931-11	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-E	T17-EB	E79931-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-E	T17-EC	E79931-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
				PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T18-A	T18-AB	E80833-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T18-A	T18-AC	E80833-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T18-B	T18-BB	E80833-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T18-C	T18-CA	E80720-12	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T18-C	T18-CB	E80720-13	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T18-C	T18-CC	E80720-14	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T18-D	T18-DB	E80721-10	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/14/2000
T18-D	T18-DC	E80720-11	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T18-E	T18-EB	E80721-7	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/14/2000
T18-E	T18-EC	E80721-8	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/14/2000
T19-A	T19-AB	E79931-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-A	T19-AC	E79931-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-B	T19-BC	E79931-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-C	T19-CB	E79933-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-C	T19-CC	E79933-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-D	T19-DB	E79933-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-E	T19-EB	E79933-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T19-E	T19-EC	E79933-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/1/2000
T20-A	T20-AB	E79932-1	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-A	T20-AC	E79932-2	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-B	T20-BB	E79932-4	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-B	T20-BC	E79932-5	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-C	T20-CC	E79932-19	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-D	T20-DB	E79932-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-D	T20-DC	E79932-16	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-E	T20-EB	E79932-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-E	T20-EC	E79932-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T21-A	T21-AB	E80047-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T21-A	T21-AC	E80047-16	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T21-C	T21-CB	E80047-17	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T21-D	T21-DB	E80047-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T21-D	T21-DC	E80047-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T21-E	T21-EB	E80048-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T21-E	T21-EC	E80048-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T22-A	T22-AC	E80554-11	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T22-B	T22-BB	E80554-13	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T22-C	T22-CC	E80721-4	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/14/2000
T22-D	T22-DB	E80554-16	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T22-D	T22-DC	E80554-17	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T22-E	T22-EB	E80556-7	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T22-E	T22-EC	E80556-8	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T23-A	T23-AB	E81102-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-A	T23-AB	E81103-4	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-A	T23-AC	E81102-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-B	T23-BB	E81102-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-B	T23-BC	E81102-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-C	T23-CA	E81102-8	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-C	T23-CB	E81102-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-D	T23-DB	E81103-1	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-D	T23-DC	E81103-2	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T24-A	T24-AB	E80318-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-A	T24-AC	E80318-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-B	T24-BB	E80318-11	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T24-B	T24-BC	E80318-12	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-D	T24-DB	E80318-15	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-D	T24-DC	E80318-16	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-E	T24-EB	E80556-4	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-E	T24-EC	E80556-5	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-A	T25-AB	E80556-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-B	T25-BB	E80554-10	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-C	T25-CA	E80554-8	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-D	T25-DB	E80554-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-D	T25-DC	E80554-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-E	T25-EB	E80554-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T25-E	T25-EC	E80554-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T26-A	T26-AC	E80047-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T26-B	T26-BB	E80048-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-B	T26-BC	E80048-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-C	T26-CB	E80048-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-C	T26-CC	E80048-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-D	T26-DB	E80047-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-D	T26-DC	E80047-10	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-E	T26-EC	E80047-7	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T27-A	T27-AC	E81103-20	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T27-B	T27-BB	E81103-16	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-B	T27-BC	E81103-17	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-C	T27-CB	E81103-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-C	T27-CC	E81103-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-D	T27-DB	E81103-9	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-D	T27-DC	E81103-10	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-E	T27-EB	E81103-6	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-E	T27-EC	E81103-7	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T28-A	T28-AB	E80157-12	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T28-A	T28-AC	E80157-13	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T28-B	T28-BB	E80157-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T28-B	T28-BC	E80157-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T28-C	T28-CC	E80157-16	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T28-D	T28-DB	E80157-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T28-E	T28-EB	E80157-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T29-A	T29-AB	E80317-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T29-A	T29-AC	E80317-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-B	T29-BB	E80318-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-B	T29-BC	E80318-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-C	T29-CB	E80318-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-C	T29-CC	E80318-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-D	T29-DB	E80317-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-D	T29-DC	E80317-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-E	T29-EB	E80317-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-E	T29-EC	E80317-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T30-A	T30-AB	E80720-2	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T30-A	T30-AC	E80720-3	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-B	T30-BB	E80720-5	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-B	T30-BC	E80720-6	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-C	T30-CB	E80721-14	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-C	T30-CC	E80721-15	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-D	T30-DB	E80720-8	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T30-D	T30-DC	E80720-9	2-3	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-E	T30-EB	E80721-11	1-2	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
S1	S1	E80721-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
S2	S2	E80721-20	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
S3	S3	E80721-19	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
S4	S4	E80721-17	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
S5	S5	E80721-18	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
S7	S7-A	E81170-19	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
S7	SDUP-1	E81104-18	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/20/2000
S8	S8-A	E81170-16	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
S9	S9-A	E81170-13	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
S10	S10-A	E81170-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
S11	S11-A	E81170-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
S12	S12-A	E81170-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
S13	S13-A	E81170-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/20/2000
T1-A	T1-AA	E81104-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/16/2000
T1-B	T1-BA	E81104-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/16/2000
T1-C	T1-CA	E81104-11	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/16/2000
T1-D	T1-DA	E81104-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/16/2000
T1-D	TDUP-21	E81104-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/16/2000
T1-E	T1-EC	E81104-16	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/16/2000
T2-A	T2-AA	E79744-13	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T2-B	T2-BA	E79745-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T2-B	T2-BB	E79745-11	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T2-C	T2-CA	E79745-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T2-C	T2-CC	E79745-9	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T2-D	T2-DA	E79745-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T2-D	T2-DC	E79745-6	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T3-A	T3-AA	E80832-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T3-B	T3-BA	E80832-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T3-C	T3-CA	E80833-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T3-C	T3-CC	E80833-10	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T3-D	T3-DA	E80831-5	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T4-C	T4-CA	E79744-16	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T4-C	TDUP5	E79744-19	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	10/30/2000
T4-C	T4-CC	E79744-18	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T4-D	T4-DA	E79744-20	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T5-C	T5-CA	E79743-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T5-D	T5-DA	E79743-5	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T6-C	T6-CA	E79744-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T6-D	T6-DA	E79744-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T6-D	T6-DC	E79744-9	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/30/2000
T7-C	T7-CA	E79745-13	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T7-D	T7-DA	E79745-16	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T7-E	T7-EC	E79743-13	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T8-C	T8-CA	E79743-20	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T8-C	TDUP6	E79745-12	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	10/31/2000
T8-D	T8-DA	E79743-17	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T8-E	T8-EC	E79743-16	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/31/2000
T9-B	T9-BA	E80555-11	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/10/2000
T11-A	T11-AA	E79555-11	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/27/2000
T11-B	T11-BA	E79555-14	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/27/2000
T11-C	T11-CA	E79555-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/27/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T11-D	T11-DA	E79555-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/27/2000
T11-D	TDUP4	E79555-7	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	10/27/2000
T11-E	T11-EC	E79555-3	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/27/2000
T13-A	T13-AA	E79453-3	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/25/2000
T13-A	T13-AB	E79453-4	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/25/2000
T13-C	T13-CA	E79452-15	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/25/2000
T13-D	T13-DB	E79452-19	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/25/2000
T13-E	T13-EB	E79452-12	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/25/2000
T13-R	T13-RA	E79452-21	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/25/2000
T14-A	T14-AA	E78963-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-A	T14-AB	E78963-8	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-A	T14-AC	E78963-9	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-B	T14-BA	E78963-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-B	T14-BB	E78963-5	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-B	T14-BC	E78963-6	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-C	T14-CA	E78964-6	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-C	T14-CB	E78964-7	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-C	T14-CC	E78964-8	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-D	T14-DA	E78963-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-D	T14-DB	E78963-2	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-D	T14-DC	E78963-3	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-E	T14-EB	E78964-10	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T14-E	T14-EC	E78964-11	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T15-A	T15-AA	E78963-18	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-A	T15-AB	E78963-19	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-A	T15-AC	E78963-20	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-B	T15-BA	E78963-21	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-B	T15-BB	E78964-1	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-B	T15-BC	E78964-2	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-C	T15-CA	E78964-3	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T15-C	T15-CB	E78964-4	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T15-C	T15-CC	E78964-5	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/18/2000
T15-D	T15-DA	E78963-15	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-D	T15-DB	E78963-16	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-D	T15-DC	E78963-17	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-E	T15-EB	E78963-12	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T15-E	T15-EC	E78963-13	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/17/2000
T16-A	T16-AA	E79452-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-A	T16-AB	E79452-2	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-A	TDUP3	E79452-4	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-A	T16-AC	E79452-3	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-B	T16-BA	E79452-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-B	T16-BB	E79452-9	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-B	T16-BC	E79452-10	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-C	T16-CA	E79452-5	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-C	T16-CB	E79452-6	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-C	T16-CC	E79452-7	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-D	T16-DA	E79453-6	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-D	T16-DB	E79453-7	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-D	T16-DC	E79453-8	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-E	T16-EB	E79453-10	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T16-E	T16-EC	E79453-11	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	10/26/2000
T17-A	T17-AA	E79931-16	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T17-A	T17-AC	E79931-18	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T17-B	T17-BA	E79931-13	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T17-C	T17-CA	E79932-6	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T17-D	T17-DA	E79932-9	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T17-D	TDUP-9	E79932-10	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T17-D	T17-DC	E79931-12	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T18-A	T18-AA	E80833-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T18-B	T18-BA	E80833-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T18-B	TDUP-19	E80833-7	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/15/2000
T18-B	T18-BC	E80833-6	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/15/2000
T18-D	T18-DA	E80721-9	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/14/2000
T19-A	T19-AA	E79931-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/1/2000
T19-B	T19-BA	E79931-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/1/2000
T19-B	T19-BB	E79931-2	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/1/2000
T19-D	T19-DA	E79933-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/1/2000
T19-D	T19-DC	E79933-10	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/1/2000
T20-A	T20-AA	E79931-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T20-B	T20-BA	E79932-3	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T20-C	T20-CA	E79932-17	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T20-C	TDUP-8	E79932-20	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/2/2000
T20-C	T20-CB	E79932-18	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T20-D	T20-DA	E79932-14	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/2/2000
T21-B	T21-BA	E80157-17	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T21-D	T21-DA	E80047-11	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T21-E	T21-EA	E80048-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T21-E	TDUP11	E80048-10	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T22-A	T22-AA	E80556-9	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T22-A	TDUP-16	E80554-19	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/9/2000
T22-A	T22-AB	E80556-10	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T22-B	T22-BA	E80554-12	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T22-B	T22-BC	E80554-14	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T22-C	T22-CA	E80721-2	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/14/2000
T22-D	T22-DA	E80554-15	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T23-A	T23-AA	E81102-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T23-B	T23-BA	E81102-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T23-B	TDUP-22	E81102-7	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T23-D	T23-DA	E81102-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T24-A	T24-AA	E80318-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T24-B	T24-BA	E80318-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T24-B	TDUP14	E80318-13	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T24-D	T24-DA	E80318-14	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T25-A	T25-AA	E80556-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T25-B	T25-BA	E80554-9	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T25-C	T25-CB	E80554-7	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T25-D	T25-DA	E80554-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/9/2000
T26-A	T26-AA	E80047-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T26-A	TDUP-10	E80047-4	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/3/2000
T26-A	T26-AB	E80047-2	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T26-B	T26-BA	E80048-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T26-C	T26-CA	E80048-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T26-D	T26-DA	E80047-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T26-E	T26-EB	E80047-6	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/3/2000
T27-A	T27-AA	E81103-18	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T27-A	T27-AB	E81103-19	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T27-B	T27-BA	E81103-15	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T27-C	T27-CA	E81103-11	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T27-C	TDUP-23	E81103-14	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/17/2000
T27-D	T27-DA	E81103-8	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/17/2000
T28-A	T28-AA	E80157-11	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T28-B	T28-BA	E80157-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T28-B	TDUP12	E80157-10	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/6/2000
T28-C	T28-CA	E80157-14	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T28-C	T28-CB	E80157-15	1-2	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T28-D	T28-DA	E80157-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T28-D	T28-DC	E80157-6	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T28-E	T28-EC	E80157-3	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/6/2000
T29-A	T29-AA	E80317-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T29-A	TDUP13	E80317-10	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/8/2000
T29-B	T29-BA	E80318-1	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T29-C	T29-CA	E80318-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T29-D	T29-DA	E80317-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/8/2000
T30-B	T30-BA	E80720-4	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
T30-B	TDUP-18	E80721-16	0-0.5	PCB, Lead, pH, TOC	SED SAMPLER	11/13/2000
T30-C	T30-CA	E80721-13	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
T30-D	T30-DA	E80720-7	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
T30-E	T30-EA	E80720-10	0-0.5	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
T30-E	T30-EC	E80721-12	2-3	PCB, Lead, pH, TOC, Grain Size	SED SAMPLER	11/13/2000
T3-E	TDUP-20	E80832-10	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH	SED SAMPLER	11/15/2000
T13-E	TDUP2	E79452-14	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH	SED SAMPLER	10/25/2000
T19-E	TDUP-7	E79933-7	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH	SED SAMPLER	11/1/2000
T20-E	T20-EA	E79932-11	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH	SED SAMPLER	11/02/00
T25-E	TDUP-15	E80554-18	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH	SED SAMPLER	11/9/2000
S14	S14	E81503-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/28/00
T1-E	T1-EA	E81104-14	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/16/00
T2-E	T2-EA	E79745-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/31/2000
T3-E	T3-EA	E80832-7	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/15/2000
T4-E	T4-EA	E79744-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/30/2000
T5-E	T5-EA	E79743-2	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/30/2000
T6-E	T6-EA	E79744-4	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/30/2000
T7-E	T7-EA	E79743-11	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/31/2000
T8-E	T8-EA	E79743-14	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/31/2000
T9-E	T9-EA	E80555-14	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/10/2000
T11-E	T11-EA	E79555-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/27/00
T13-E	T13-EA	E79452-11	2.0-2.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/25/00
T14-E	T14-EA	E78964-9	1.0-1.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/18/00
T15-E	T15-EA	E78963-11	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/17/00
T15-E	TDUP-1	E78963-14	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/17/2000
T16-E	T16-EA	E79453-9	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	10/26/00
T17-E	T17-EA	E79931-7	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/01/00
T18-E	T18-EA	E80721-6	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/14/00
T19-E	T19-EA	E79933-4	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/01/00
T21-A	T21-AA	E80047-14	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/03/00
T22-E	T22-EA	E80556-6	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/09/00
T23-E	T23-EA	E81103-3	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/17/00
T24-E	T24-EA	E80556-3	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/09/00
T25-E	T25-EA	E80554-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/09/00

Table 4-4
Matteo Iron and Metal
Sediment Sample Summary Table

Location	Sample ID	Lab ID	Depth (ft. bgs)	Analytical Parameters	Sampling Method	Date
SEDIMENT SAMPLES						
T26-E	T26-EA	E80047-5	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/3/2000
T27-E	T27-EA	E81103-5	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/17/2000
T28-E	T28-EA	E80157-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/6/2000
T29-E	T29-EA	E80317-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/8/2000
T30-AA	T30-AA	E80720-1	0-0.5	VOC, SVOC, PPCB, METALS, TOC, pH, Grain Size	SED SAMPLER	11/13/2000

TABLE 5-1
Matte Iron and Metal
PCB Exceedances in Shallow Soil

Sample Location	Sample ID	Lab ID	Date	Depth ft	Aroclor 1248 mg/kg	Aroclor 1254 mg/kg	Aroclor 1260 mg/kg	Total Aroclor mg/kg	Residential Criteria	Non Residential Criteria	Field Screening
New Jersey Soil Cleanup Criteria											
SS22	SS22B	E78043-11	10/2/2000	1-1.5	0.035 U	6	0.035 U	6	0.49	2	> 0.5 ppm
	SS22C		10/10/2000	2-2.5							Yes
	SS22D	E78671-1	10/11/2000	3-3.5	0.036 U	0.28	0.036 U	0.28	0.28	0.28	Yes
S22N1	S22N1A		9/14/2000	0-0.5							No
S22N3	S22N3A		9/29/2000	0-0.5							Yes
S22N6	S22N6A		10/2/2000	0-0.5							Yes
	S22N6B	E79272-7	10/24/2000	1-1.5	0.047 U	0.047 U	0.047 U	0.047 U	0.047 U	0.047 U	
S22N9	S22N9A		10/2/2000	0-0.5							Yes
	S22N12A		10/4/2000	0-0.5							Yes
S22N12	S22N12B	E79272-5	10/24/2000	1-1.5	0.042 U	1.200 J	0.260 J	1.46		1.46	
	S22N12C	E85530-14	2/6/2001	2-2.5	0.037 U	0.25	0.037 U	0.25	0.25	0.25	
	S22N15A	E78266-8	10/5/2000	0-0.5	0.038 U	21	0.038 U	21			Yes
S22N18	S22N18A		10/5/2000	0-0.5							Yes
	S22N18B	E79272-3	10/24/2000	3-3.5	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	
S22N24	S22N21A		10/5/2000	0-0.5							Yes
	S22N24A		10/6/2000	0-0.5							Yes
	S22N24B		10/12/2000	1-1.5							Yes
	S22N24C	E79272-1	10/24/2000	2-2.5	0.040 U	0.040 U	0.096	0.096	0.096	0.096	
S22NE6	S22NE6A	E78265-12	10/5/2000	0-0.5	0.039 U	3	0.039 U	3			Yes
	22NE6B	E79272-11	10/24/2000	1-1.5	0.035 U	0.39	0.035 U	0.39	0.39	0.39	
22NE12	22NE12A		10/6/2000	0-0.5							
	22NE12B	E79272-9	10/24/2000	1-1.5	0.042 U	0.37	0.11	0.48	0.48	0.48	Yes
S22E1	S22E1A		9/14/2000	0-0.5							Yes
S22E3	S22E3A		9/29/2000	0-0.5							Yes
	S22SE6A		10/5/2000	0-0.5							Yes
S22SE6	S22SE6B	E79140-2	10/19/2000	1-1.5	0.038 U	3.5	1.8	5.3			
	S22SE6C	E79140-3	10/19/2000	2-2.5	0.040 U	0.41	0.092	0.502	0.502	0.502	
	S22SE6D	E85530-12	2/6/2001	3-3.5	0.039 U	0.11	0.039 U	0.11	0.11	0.11	
	22SE12A	E78372-4	10/6/2000	0-0.5	0.040 U	9.6	0.040 U	9.6			Yes
S22SE12	22SE12B	E78964-18	10/19/2000	1-1.5	0.036 U	0.24	0.13	0.37	0.37	0.37	
	22SE12C	E78964-19	10/19/2000	2-2.5	0.035 U	0.24	0.063	0.303	0.303	0.303	
	22SE18A	E78373-9	10/10/2000	0-0.5	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	No
S22S1	S22S1A		9/14/2000	0-0.5							Yes
S22S3	S22S3A		9/29/2000	0-0.5							Yes
	S22S6A		10/2/2000	0-0.5							Yes
	S22S6B	E79140-8	10/20/2000	1-1.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	
	S22S6C	E79140-9	10/20/2000	2-2.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
S22S9	PCBDUP9	E79140-10	10/20/2000	2-2.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	
	S22S9A		10/2/2000	0-0.5							Yes
S22S12	S22S12A	E78266-3	10/4/2000	0-0.5	0.037 U	15	0.037 U	15			Yes
	S22S12B	E79140-6	10/20/2000	1-1.5	0.035 U	0.044	0.035 U	0.044	0.044	0.044	
	S22S12C	E79140-7	10/20/2000	2-2.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
S22S15	S22S15A		10/5/2000	0-0.5							Yes
	S22S18A		10/5/2000	0-0.5							Yes
S22S18	S22S18B	E79140-4	10/19/2000	1-1.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S22S18C	E79140-5	10/19/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S22S21A	E78265-10	10/5/2000	0-0.5	0.035 U	0.28	0.1	0.38	0.38	0.38	No
S22S30	S22S30A	E78373-17	10/10/2000	0-0.5	0.036 U	0.072	0.036 U	0.072	0.072	0.072	No
	S22SW6A		10/5/2000	0-0.5							Yes
	S22SW6B	E78964-22	10/19/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
	S22SW6C	E79140-1	10/19/2000	2-2.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	
22SW12	22SW12A		10/6/2000	0-0.5							Yes
	22SW12B	E78964-20	10/19/2000	1-1.5	0.042 U	0.066 J	0.042 U	0.066	0.066	0.066	
	22SW12C	E78964-21	10/19/2000	2-2.5	0.038 U	1.2	0.270 J	1.47	1.47	1.47	
	22SW12D	E85530-13	06-FEB-01	3-3.5	0.052 U	2.8	0.45 J	3.25	3.25	3.25	
S22W1	S22W1A	E76840-1	9/14/2000	0-0.5	0.037 U	4.8 J	0.63	5.43	5.43	5.43	Yes
	PCBDUP3	E76840-4	9/14/2000	0-0.5	0.036 U	4.4 J	0.71	5.11	5.11	5.11	
	S22W3A		9/29/2000	0-0.5							Yes
S22W3	S22W3B	E78964-16	10/19/2000	1-1.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S22W3C	E78964-17	10/19/2000	2-2.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
S22W6	S22W6A		10/2/2000	0-0.5							Yes
	S22W9A		10/2/2000	0-0.5							Yes
S22W9	S22W9B	E78964-14	10/19/2000	1-1.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S22W9C	E78964-15	10/19/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S22W12	S22W12A		10/4/2000	0-0.5							Yes
	S22W15A		10/5/2000	0-0.5							Yes
	S22W15B		10/12/2000	1-1.5							Yes
	S22W15C	E78964-12	10/19/2000	2-2.5	0.037 U	0.12	0.037 U	0.12	0.12	0.12	
S22W18	S22W15D	E78964-13	10/19/2000	3-3.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S22W18A		10/5/2000	0-0.5							Yes
S22W21	S22W21A		10/5/2000	0-0.5							Yes
	S22W21B	E78671-6	10/11/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
22NW12	S22NW6A	E78265-11	10/5/2000	0-0.5	0.035 U	0.41 J	0.1 J	0.51	0.51	0.51	No
	22NW12A		10/6/2000	0-0.5							Yes
22NW18	22NW12B	E79272-19	10/24/2000	1-1.5	0.044 U	0.044 U	0.044 U	0.044 U	0.044 U	0.044 U	
	22NW18A	E78373-8	10/10/2000	0-0.5	0.033 U	0.096 J	0.082	0.178	0.178	0.178	No
SS25	SS25B		9/7/2000	1-1.5							Yes
	SS25C	E76418-1	9/7/2000	2-2.5	0.034 U	0.12	0.034 U	0.12	0.12	0.12	No

TABLE 5-1
Matteo Iron and Metal
 PCB Exceedances in Shallow Soil

Sample Location	Sample ID	Lab ID	Date	Depth ft	Aroclor 1248 mg/kg	Aroclor 1254 mg/kg	Aroclor 1260 mg/kg	Total Aroclor mg/kg	Residential Criteria	Non Residential Criteria	Field Screening
New Jersey Soil Cleanup Criteria									0.49	2	> 0.5 ppm
S25N1	S25N1A		9/7/2000	0-0.5							Yes
S25N3	S25N3A	E76419-20	9/7/2000	0-0.5	0.035 U	0.054	0.035 U	0.054	0.054	0.054	No
	S25N6A		10/4/2000	0-0.5							Yes
S25N6	S25N6B	E78671-9	10/11/2000	1-1.5	0.037 U	0.086	0.038	0.124	0.124	0.124	No
S25N9	S25N9A	E78266-5	10/5/2000	0-0.5	0.034 U	0.089 J	0.034 U	0.089	0.089	0.089	No
	S25NE6A		10/4/2000	0-0.5							Yes
	S25NE6B		10/11/2000	1-1.5							Yes
	S25NE6C		10/12/2000	2-2.5							Yes
	S25NE6D	E79272-13	10/24/2000	3-3.5	0.035 U	0.039	0.035 U	0.039	0.039	0.039	
S25NE8	S25NE8A	E78266-6	10/5/2000	0-0.5	0.037 U	0.11 J	0.037 U	0.11	0.11	0.11	No
S25E1	S25E1A		9/7/2000	0-0.5							Yes
S25E3	S25E3A		9/7/2000	0-0.5							Yes
S25E5	S25E5A		9/8/2000	0-0.5							Yes
S25E7	S25E7A	E76418-5	9/8/2000	0-0.5	0.034 U	0.16	0.056	0.216	0.216	0.216	No
	S25SE6A		10/4/2000	0-0.5							Yes
	S25SE6B		10/12/2000	1-1.5							Yes
	S25SE6C	E79140-19	10/20/2000	2-2.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
	S25SE6D	E79140-20	10/20/2000	3-3.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
	S25SE0A		10/5/2000	0-0.5							Yes
	S25SE0B		10/12/2000	1-1.5							Yes
S25S1	S25S1A		9/7/2000	0-0.5							Yes
S25S3	S25S3A	E76419-21	9/7/2000	0-0.5	0.035 U	0.2	0.035 U	0.2	0.2	0.2	No
	S25S8A		10/5/2000	0-0.5							Yes
S25S8	S25S8B	E78671-15	10/12/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
S25S10	S25S10A	E78266-10	10/5/2000	0-0.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
S25W1	S25W1A		9/7/2000	0-0.5							Yes
S25W4	S25W4A		9/7/2000	0-0.5							Yes
	S26N1A	E76234-7	9/5/2000	0-0.5	0.036 U	2.1	0.036 U	2.1	2.1	2.1	Yes
	S26N1B		9/6/2000	1-1.5							Yes
	S26N1C	E76419-22	9/7/2000	2-2.5	0.038 U	2.6	0.038 U	2.6	2.6	2.6	No
	S26N2A		9/6/2000	0-0.5							Yes
	S26N2B		9/7/2000	1-1.5							Yes
S26N3	S26N3A	E76234-1	9/6/2000	0-0.5	0.037 U	0.11	0.037 U	0.11	0.11	0.11	No
S26N11	S26N11A		10/5/2000	0-0.5							Yes
S26N13	S26N13A		10/5/2000	0-0.5							Yes
S26NE2	S26NE2A		9/6/2000	0-0.5							Yes
S26NE4	S26NE4A		9/8/2000	0-0.5							Yes
	S26NE6A		9/8/2000	0-0.5							Yes
	S26NE6B	E78671-8	10/11/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
	PCBDUP8		10/11/2000	1-1.5	0.050 U	0.050 U	0.053	0.053	0.053	0.053	
S26NE9	S26NE9A	E78043-7	10/2/2000	0-0.5	0.036 U	0.08	0.064	0.144	0.144	0.144	No
S26NE0	S26NE0A		10/4/2000	0-0.5							Yes
S26E1	S26E1A	E76235-3	9/5/2000	0-0.5	0.037 U	0.12	0.037 U	0.12	0.12	0.12	No
S26E5	S26E5A	E76418-7	9/8/2000	0-0.5	0.038 U	0.2	0.038 U	0.2	0.2	0.2	No
S26E7	S26E7A	E76418-9	9/8/2000	0-0.5	0.036 U	0.15	0.036 U	0.15	0.15	0.15	No
S26S1	S26S1A	E76235-2	9/5/2000	0-0.5	0.036 U	0.7	0.036 U	0.7	0.7	0.7	No
	S26W1A		9/5/2000	0-0.5							Yes
	S26W1B		9/6/2000	1-1.5							Yes
S26W2	S26W2A	E76235-1	9/6/2000	0-0.5	0.036 U	0.18 J	0.036 U	0.18	0.18	0.18	No
S26NW2	S26NW2A		9/6/2000	0-0.5							Yes
	S26NW4A		9/8/2000	0-0.5							Yes
	S26NW4B		10/11/2000	1-1.5							Yes
	S26NW4C	E78671-12	10/12/2000	2-2.5	0.036 U	7.7 D	0.036 U	7.7	7.7	7.7	Yes
S26NW6	S26NW6A	E76418-13	9/8/2000	0-0.5	0.035 U	0.059 J	0.035 U	0.059	0.059	0.059	No
26NW11	26NW11A	E78265-7	10/5/2000	0-0.5	0.050 U	2	0.65	2.65	2.65	2.65	Yes
	SS27C	E76235-7	9/6/2000	2-2.5	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	No
	PCBDUP1	E76234-2	9/6/2000		0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	
	S27N1A		9/5/2000	0-0.5							Yes
	S27N1B		9/6/2000	1-1.5							Yes
	S27N1C	E76235-8	9/6/2000	2-2.5	0.034 U	0.08	0.034 U	0.08	0.08	0.08	No
	S27N2A		9/6/2000	0-0.5							Yes
	S27N2B	E76418-4	9/7/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	Yes
	PCBDUP2	E76418-2	9/7/2000	1-1.5	0.035 U	0.41	0.035 U	0.41	0.41	0.41	
	S27N2C		9/8/2000	2-2.5							Yes
S27NE2	S27NE2A		9/6/2000	0-0.5							Yes
	S27E1A	E76234-8	9/5/2000	0-0.5	0.035 U	1.1	0.035 U	1.1	1.1	1.1	Yes
	S27E1B	E76235-4	9/6/2000	1-1.5	0.035 U	0.092	0.035 U	0.092	0.092	0.092	No
S27E2	S27E2A	E76235-6	9/6/2000	0-0.5	0.035 U	0.22	0.035 U	0.22	0.22	0.22	No
S27SE3	S27SE3A		9/7/2000	0-0.5							Yes
	S27SE5A	E76418-12	9/8/2000	0-0.5	0.034 U	0.12 J	0.034 U	0.12	0.12	0.12	Yes
	S27SE5B	E79140-17	10/20/2000	1-1.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	
	S27SE5C	E79140-18	10/20/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S27SE7	S27SE7A	E76418-10	9/8/2000	0-0.5	0.034 U	0.11 J	0.034 U	0.11	0.11	0.11	No
	S27S1A		9/5/2000	0-0.5							Yes
	S27S1B		9/6/2000	1-1.5							Yes
S27S1	S27S1C	E76235-9	9/6/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	No

TABLE 5-1
Matteo Iron and Metal
PCB Exceedances in Shallow Soil

Sample Location	Sample ID	Lab ID	Date	Depth ft	Aroclor 1248 mg/kg	Aroclor 1254 mg/kg	Aroclor 1260 mg/kg	Total Aroclor mg/kg	Residential Criteria	Non Residential Criteria	Field Screening
New Jersey Soil Cleanup Criteria									0.49	2	> 0.5 ppm
S27S2	S27S2A	E76235-5	9/6/2000	0-0.5	0.034 U	0.12	0.034 U	0.12	0.12	0.12	No
S27S5	S27S5A	E76418-11	9/8/2000	0-0.5	0.039 U	0.41	0.039 U	0.41	0.41	0.41	Yes
S27S7	S27S7A		9/8/2000	0-0.5							Yes
	S27S7B	E78671-11	10/12/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
S27S0	S27S0A		10/4/2000	0-0.5							Yes
S27S12	S27S12A		10/5/2000	0-0.5							Yes
S27S14	S27S14A		10/5/2000	0-0.5							Yes
	S27S14B	E78671-5	10/11/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
S27S16	S27S16A	E78266-11	10/5/2000	0-0.5	0.035 U	0.035 U	0.081	0.081	0.081	0.081	No
S27SW2	S27SW2A		9/6/2000	0-0.5							Yes
S27SW4	S27SW4A		9/8/2000	0-0.5							Yes
	S27SW6A		9/8/2000	0-0.5							Yes
S27SW6	S27SW6B	E79140-15	10/20/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
	S27SW6C	E79140-16	10/20/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S27W1	S27W1A		9/5/2000	0-0.5							Yes
	S27W1B		9/6/2000	1-1.5							Yes
	S27W1C	E76235-10	9/6/2000	2-2.5	0.035 U	0.054 J	0.035 U	0.054	0.054	0.054	No
S27W2	S27W2A		9/6/2000	0-0.5							Yes
	S27W2B	E76235-11	9/6/2000	1-1.5	0.034 U	0.067 J	0.034 U	0.067	0.067	0.067	No
S27W3	S27W3A		9/6/2000	0-0.5							Yes
S27NW2	S27NW2A		9/6/2000	0-0.5							Yes
SS28	SS28B		9/7/2000	1-1.5							Yes
	SS28C		9/7/2000	2-2.5							Yes
S28N1	S28N1A		9/7/2000	0-0.5							Yes
S28N3	S28N3A	E76419-19	9/7/2000	0-0.5	0.038 U	0.11	0.038 U	0.11	0.11	0.11	No
S28N8	S28N8A	E78373-7	10/10/2000	0-0.5	0.035 U	0.16 J	0.035 U	0.16	0.16	0.16	No
S28E1	S28E1A	E76418-3	9/7/2000	0-0.5	0.038 U	13 DJ	0.038 U	13	13	13	Yes
S28E2	S28E2A		9/7/2000	0-0.5							Yes
	S28E2B	E79272-17	10/24/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
S28S1	S28S1A		9/7/2000	0-0.5							Yes
S28S2	S28S2D		9/8/2000	3-3.5							Yes
S28S3	S28S3A		9/7/2000	0-0.5							Yes
S28S5	S28S5A		9/8/2000	0-0.5							Yes
	S28S7A		9/8/2000	0-0.5							Yes
	S28S7B		10/12/2000	1-1.5							Yes
	S28S7C	E79140-13	10/20/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S28S7D	E79140-14	10/20/2000	3-3.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S28S0	S28S0A		10/4/2000	0-0.5							Yes
S28S12	S28S12A		10/5/2000	0-0.5							Yes
S28S14	S28S14A		10/5/2000	0-0.5							Yes
	S28S14B	E78671-4	10/11/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
S28S16	S28S16A	E78265-5	9/5/2000	0-0.5	0.036 U	0.058 J	0.044	0.102	0.102	0.102	No
S28SW5	S28SW5A		9/8/2000	0-0.5							Yes
	S28SW7A		9/8/2000	0-0.5							Yes
	S28SW7B		10/12/2000	1-1.5							Yes
S28SW7	S28SW7C	E79140-11	10/20/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S28SW7D	E79140-12	10/20/2000	3-3.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S28SW0	S28SW0A		10/4/2000	0-0.5							Yes
	S28SW12A		10/5/2000	0-0.5							Yes
	S28SW12B	E78671-3	10/11/2000	1-1.5	0.037 U	1.4 D	1.6	3			Yes
	S28SW12C		10/12/2000	2-2.5							Yes
	S28SW12D	E79273-14	10/24/2000	3-3.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
S28SW14	S28SW14A	E78266-9	10/5/2000	0-0.5	0.037 U	0.11 J	0.051	0.161	0.161	0.161	No
S28W16	S28W16A	E78265-6	10/5/2000	0-0.5	0.035 U	0.08	0.045	0.125	0.125	0.125	No
S28W1	S28W1A		9/7/2000	0-0.5							Yes
S28W3	S28W3A		9/7/2000	0-0.5							Yes
S28W5	S28W5A		9/8/2000	0-0.5							Yes
	S28W5B	E79272-15	10/24/2000	1-1.5	0.044 U	0.15	0.044 U	0.15	0.15	0.15	
S28W7	S28W7A	E76418-8	9/8/2000	0-0.5	0.038 U	0.23	0.038 U	0.23	0.23	0.23	No
S28NW4	S28NW4A		9/8/2000	0-0.5							Yes
	S28NW4B	E78671-7	10/11/2000	1-1.5	0.040 U	0.06	0.040 U	0.06	0.06	0.06	No
S28NW6	S28NW6A	E76418-6	9/8/2000	0-0.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
SS34	SS34B		10/2/2000	1-1.5							Yes
	SS34C	E78510-7	10/10/2000	2-2.5	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	No
S34N1	S34N1A		9/14/2000	0-0.5							Yes
S34N3	S34N3A		9/29/2000	0-0.5							Yes
	S34N3B	E79274-7	10/23/2000	1-1.5	0.037 U	8.7 D	1.8 D	10.5	10.5	10.5	
	S34N3C	E85530-9	2/6/2001	2-2.5	0.044 U	1.8 D	0.98 D	2.78	2.78	2.78	
S34N6	S34N6A	E78372-1	10/6/2000	0-0.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
S34NE6	S34NE6A		10/6/2000	0-0.5							Yes
	S34NE6B	E79274-5	10/23/2000	1-1.5	0.037 U	6.2 D	1.5 D	7.7	7.7	7.7	
	S34NE6C	E85530-10	2/6/2001	2-2.5	0.044 U	24 D	8.2 D	32.2	32.2	32.2	
S34E1	S34E1A		9/14/2000	0-0.5							Yes
S34E3	S34E3A		9/29/2000	0-0.5							Yes
S34E6	S34E6A		9/29/2000	0-0.5							Yes
	S34E6B	E79274-3	10/23/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	
S34E9	S34E9A		10/5/2000	0-0.5							Yes

TABLE 5-1
Matteo Iron and Metal
PCB Exceedances in Shallow Soil

Sample Location	Sample ID	Lab ID	Date	Depth ft	Aroclor 1248 mg/kg	Aroclor 1254 mg/kg	Aroclor 1260 mg/kg	Total Aroclor mg/kg	Residential Criteria	Non Residential Criteria	Field Screening
New Jersey Soil Cleanup Criteria									0.49	2	> 0.5 ppm
S34E12	S34E12A		10/6/2000	0-0.5							Yes
	S34E12B	E79274-1	10/23/2000	1-1.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	Yes
S34SE6	S34SE6A	E78372-2	10/6/2000	0-0.5	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	No
	PCBDUP7	E78372-5	10/6/2000	0-0.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	No
	S34SE12A		10/10/2000	0-0.5							Yes
34SE12	S34SE12B	E79274-9	10/23/2000	1-1.5	0.037 U	0.65	0.98	1.63		1.63	
	S34SE12C	E85530-8	2/6/2001	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S34SE15	S34SE15A	E78510-2	10/10/2000	0-0.5	0.039 U	0.13	0.14	0.27	0.27	0.27	No
S34S1	S34S1A	E76840-3	9/14/2000	0-0.5	0.035 U	0.18	0.038	0.218	0.218	0.218	No
S34S6	S34S6A	E78510-3	10/10/2000	0-0.5	0.036 U	0.036 U	0.054	0.054	0.054	0.054	No
S34W1	S34W1A	E76840-2	9/14/2000	0-0.5	0.038 U	0.5 J	0.083	0.583		0.583	No
	S34W1B	E85530-7	2/6/2001	1-1.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
S34W3	S34W3A	E85530-6	2/6/2001	0-0.6	0.038 U	2.2 D	0.31 D	2.51			
SS35	SS35B		10/2/2000	1-1.5							Yes
	SS35C	E78510-8	10/10/2000	2-2.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	No
	S35N1A		9/14/2000	0-0.5							Yes
S35N1	S35N1B	E79274-11	10/23/2000	1-1.5	0.036 U	3.8 D	36 D	39.8			
	S35N1C	E79273-1	10/23/2000	2-2.5	0.034 U	0.034 U	3.8 D	3.8			
	S35N1D	E85530-3	2/6/2001	3-3.5	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	
S35N3	S35N3A	E77892-5	9/29/2000	0-0.5	0.042 U	2.1 DJ	0.85 D	2.95			No
	S35N3B	E85530-4	2/6/2001	1-1.5	0.039 U	0.043	0.041	0.084	0.084	0.084	
S35N6	S35N6A	E85530-5	2/6/2001	0-0.5	0.045 U	0.045 U	0.3	0.3	0.3	0.3	
S35E1	S35E1A		9/14/2000	0-0.5							Yes
	S35E1B	E79273-4	10/23/2000	1-1.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	
S35E3	S35E3A	E77892-7	9/29/2000	0-0.5	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	No
S35S1	S35S1A		9/14/2000	0-0.5							Yes
	S35S1B	E79273-2	10/23/2000	1-1.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	
S35S3	S35S3A	E77892-6	9/29/2000	0-0.5	0.038 U	0.2 J	0.066	0.266	0.266	0.266	No
	S35W1A		9/14/2000	0-0.5							Yes
S35W1	S35W1B	E79273-6	10/23/2000	1-1.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	
	S35W1C	E79273-7	10/23/2000	2-2.5	0.038 U	0.1	0.068	0.168	0.168	0.168	
S35W3	S35W3A	E77892-4	9/29/2000	0-0.5	0.038 U	0.54 J	0.18	0.72	0.72	0.72	No
PCB 1	PCB 1A	E77893-2	9/28/2000	0-0.5	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	No
PCB 2	PCB 2A	E77893-5	9/28/2000	0-0.5	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	No
PCB 3	PCB 3A	E77893-4	9/28/2000	0-0.5	0.044 U	0.044 U	0.044 U	0.044 U	0.044 U	0.044 U	No
PCB 4	PCB 4A	E77893-3	9/28/2000	0-0.5	0.038 U	0.15 J	0.091 J	0.241	0.241	0.241	No
PCB 5	PCB 5A	E77893-6	9/28/2000	0-0.5	0.039 U	0.14 J	0.14	0.28	0.28	0.28	No
PCB 6	PCB 6A	E77893-9	9/28/2000	0-0.5	0.038 U	0.093	0.06	0.153	0.153	0.153	No
	PCB DUP4	E77893-11	9/28/2000	0-0.5	0.039 U	0.12 J	0.1 J	0.22	0.22	0.22	
PCB 7	PCB 7A	E77893-10	9/28/2000	0-0.5	0.038 U	0.038 U	0.051	0.051	0.051	0.051	No
PCB 8	PCB 8A	E77892-3	10/29/2000	0-0.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	No
PCB 9	PCB 9A	E77893-7	9/28/2000	0-0.5	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	No
PCB 10	PCB 10A	E77893-1	9/28/2000	0-0.5	0.038 U	0.071	0.057	0.128	0.128	0.128	No
	PCB11A		9/28/2000	0-0.5							Yes
	PCB11B		10/2/2000	1-1.5							Yes
	PCB11C		10/10/2000	2-2.5							Yes
	PCB11D	E78671-2	10/11/2000	3-3.5	0.037 U	0.098	0.043 J	0.141	0.141	0.141	No
	PB11N1A		9/29/2000	0-0.5							Yes
PB11N1	PB11N1B	E85530-11	2/6/2001	1-1.5	0.044 U	20 D	4.1	24.1			
	PB11N1C	E79273-11	10/24/2000	2-2.5	0.040 U	0.054	0.040 U	0.054	0.054	0.054	
PB11E1	PB11E1A		9/29/2000	0-0.5							Yes
	PB11E1B	E79273-9	10/24/2000	1-1.5	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	
PB11E3	PB11E3A	E78043-5	10/2/2000	0-0.5	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	No
PB11S1	PB11S1A	E77893-15	9/29/2000	0-0.5	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	No
PB11S3	PB11S3A	E78043-4	10/2/2000	0-0.5	0.040 U	0.095 J	0.056	0.151	0.151	0.151	No
PB11W1	PB11W1A	E77893-17	9/29/2000	0-0.5	0.042 U	1	0.46	1.46		1.46	Yes
	PB11W1B	E79273-10	10/24/2000	1-1.5	0.039 U	0.01	0.074	0.174	0.174	0.174	
PB11W3	PB11W3A	E78266-7	10/5/2000	0-0.5	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	0.041 U	No
P11N'W3	P11N'W3A	E78372-3	10/6/2000	0-0.5	0.040 U	0.051 J	0.05	0.101	0.101	0.101	No
	PCB12A	E77893-8	9/28/2000	0-0.5	0.160 U	3.3	0.52	3.82			Yes
	PCB12B		10/2/2000	1-1.5							Yes
	PCB12C	E78510-6	10/10/2000	2-2.5	0.77 D	4.6 J	0.64	6.01			Yes
	PCB12D		10/11/2000	3-3.5							Yes
	PCB12E		10/12/2000	4-4.5							Yes
PB12N1	PB12N1A	E77892-9	9/29/2000	0-0.5	0.042 U	0.49	0.12	0.61	0.61	0.61	Yes
	PCBDUP5	E77892-8	9/29/2000	0-0.5	0.041 U	0.47	0.12	0.59	0.59	0.59	
PB12N3	PB12N3A		10/2/2000	0-0.5							Yes
PB12E1	PB12E1A		9/29/2000	0-0.5							Yes
PB12E3	PB12E3A	E78043-3	10/2/2000	0-0.5	0.040 U	0.056 J	0.045	0.101	0.101	0.101	No
P12SE2	P12SE2A		10/6/2000	0-0.5							Yes
PB12S1	PB12S1A		9/29/2000	0-0.5							Yes
PB12S3	PB12S3A	E78043-10	10/2/2000	0-0.5	0.053 U	30	0.053 U	30	30	30	Yes
PB12S6	PB12S6A	E78043-6	10/2/2000	0-0.5	0.039 U	0.087	0.11	0.197	0.197	0.197	No
P12SW6	P12SW6A		10/5/2000	0-0.5							Yes
P12SW9	P12SW9A		10/6/2000	0-0.5							Yes
PB12W1	PB12W1A		9/29/2000	0-0.5							Yes
PB12W3	PB12W3A		10/2/2000	0-0.5							Yes
PB12W6	PB12W6A	E78043-9	10/2/2000	0-0.5	0.050 U	33	16	49	49	49	Yes

TABLE 5-1
Matteo Iron and Metal
PCB Exceedances in Shallow Soil

Sample Location	Sample ID	Lab ID	Date	Depth ft	Aroclor 1248 mg/kg	Aroclor 1254 mg/kg	Aroclor 1260 mg/kg	Total Aroclor mg/kg	Residential Criteria	Non Residential Criteria	Field Screening
New Jersey Soil Cleanup Criteria									0.49	2	> 0.5 ppm
PB12W9	PB12W9A	E78266-2	10/4/2000	0-0.5	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	0.039 U	No
	PCBDUP6	E78266-4	10/4/2000	0-0.5	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	No
P12NW6	P12NW6A		10/5/2000	0-0.5							Yes
	PCB13A		9/28/2000	0-0.5							Yes
PCB13	PCB12B		10/2/2000	1-1.5							Yes
	PCB13C	E78510-5	10/10/2000	2-2.5	0.037 U	0.058 J	0.047	0.105	0.105	0.105	No
PB13N1	PB13N1A	E77892-10	9/29/2000	0-0.5	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	0.042 U	Yes
PB13N3	PB13N3A		10/2/2000	0-0.5							Yes
	P13N3B	E78510-4	10/10/2000	1-1.5	0.037 U	0.054 J	0.074	0.128	0.128	0.128	No
PB13N6	PB13N6A	E78043-8	10/2/2000	0-0.5	0.036 U	0.55	0.12	0.67	0.67	0.67	No
	P13N6B	E85530-1	2/6/2001	1-1.5	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	No
P13N9	P13N9A	E85530-2	2/6/2001	0-0.5	0.041 U	0.041 U	0.058	0.058	0.058	0.058	
	PCBDUP1	E85530-15	2/6/2001	0-0.5	0.040 U	0.088 J	0.059	0.147	0.235	0.146	
P13NE4	P13NE4A	E78265-8	10/5/2000	0-0.5	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	No
PB13E1	PB13E1A	E77893-12	9/28/2000	0-0.5	0.043 U	0.043 U	0.046	0.046	0.046	0.046	No
PB13S1	PB13S1A	E77893-14	9/29/2000	0-0.5	0.042 U	0.12	0.082	0.202	0.202	0.202	No
PB13W1	PB13W1A	E77893-13	9/29/2000	0-0.5	0.043 U	0.081	0.071	0.152	0.152	0.152	No
P13NW6	P13NW6A	E78265-9	10/5/2000	0-0.5	0.040 U	0.067	0.040 U	0.067	0.067	0.067	No
PCB14	PCB 14A	E77893-16	9/29/2000	0-0.5	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	No
PCB15	PCB15A	E78266-1	10/4/2000	0-0.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	No
PCB16	PCB16A		10/10/2000	0-0.5							Yes
P16SE3	P16SE3A	E78510-1	10/10/2000	0-0.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	No
PCB17	PCB17A	E78373-10	10/10/2000	0-0.5	0.042 U	0.26	0.1	0.36	0.36	0.36	No
PCB18	PCB18A		10/10/2000	0-0.5							Yes
P18SW3	P18SW3A	E78373-16	10/10/2000	0-0.5	0.036 U	0.064 J	0.036 U	0.064	0.064	0.064	No
PCB19	PCB19A	E78373-11	10/10/2000	0-0.5	0.038 U	0.220 J	0.081	0.301	0.301	0.301	No
PCB20	PCB20A	E78373-12	10/10/2000	0-0.5	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	0.036 U	No
PCB21	PCB21A	E78373-15	10/10/2000	0-0.5	0.048 U	1.8	0.76	2.56	2.56	2.56	Yes
PCB22	PCB22A	E78373-13	10/10/2000	0-0.5	0.040 U	0.26	0.13	0.39	0.39	0.39	No
PCB23	PCB23A	E78373-14	10/10/2000	0-0.5	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	0.038 U	No

Notes:

- Shaded total values meet or exceed N.J. Residential Soil Criteria, and/or Non-Residential Criteria as indicated.
- Bold values indicate concentrations above Method Detection Limit (MDL).
- All results in mg/kg.
- U = Not detected above the Contract Required Quantitation Limit (CRQL).
- J = Estimated concentration
- PCB Screenings with immunoassay kits result: Yes (>0.5 mg/kg); or No (<0.5 mg/kg)

TABLE 5-2
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-01	GP-02	GP-03	GP-04	GP-05	GP-05	GP-06	GP-07	GP-07	GP-07	GP-08	GP-09	GP-10													
SAMPLE ID		GP-01A	GP-02A	GP-03A	GP-04A	GP-05A	GP 5C	GP-06A	GP-07A	GP 7C	DUPE 02	GP-08A	GP-09A	GP-10A													
LAB ID		E76579-1	E76579-3	E76579-5	E76579-7	E76579-9	N12323-21	E76579-11	E76579-13	N12322-6	N12323-30	E72117-15	E76579-17	E76579-19													
DATE		9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2002	9/11/2000	9/11/2000	9/11/2002	9/11/2002	9/11/2000	9/11/2000	9/11/2000													
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	1.5 - 2	0-0.5	0-0.5	1.5 - 2	1.5 - 2	0-0.5	0-0.5	0-0.5													
ANALYTE	NJDEP																										
Pesticide & PCB	Residential	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q												
Dieldrin	0.042	0.0034 U		0.017 U		0.0035 U		0.019 U		0.0041 U		NA		0.0035 U		0.038 U		NA		0.0036 U		0.018 U		0.019 U			
Aroclor 1242	0.49	0.034 U		0.17 U		0.035 U		0.19 U		0.041 U		0.017 U 1		0.035 U		0.38 U		0.017 U		0.018 U 1		0.036 U		0.18 U		0.19 U	
Aroclor 1248	0.49	0.034 U		0.17 U		0.035 U		0.19 U		0.041 U		0.017 U 1		0.035 U		0.38 U		0.017 U		0.018 U 1		0.036 U		0.18 U		0.19 U	
Aroclor 1254	0.49	0.079		190 D		0.035 U		0.3		0.07		0.017 U 1		0.035 U		0.38 U		0.19		0.018 U 1		0.036 U		0.18 U		0.63	
Aroclor 1260	0.49	0.034 U		26 DJ		0.035 U		0.6		0.18		0.017 U 1		0.035 U		0.38 U		0.017 U		0.018 U 1		0.07		0.18 U		0.19 U	
Total Aroclor	0.49	0.079		216		0.035 U		0.6		0.88		0		0.035 U		0.38 U		0.19		0		0.07		0.18 U		2.03	
Metals		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	NC	2,980		3,930		3,450		2,250		5,130		3290 I		901		8,040		3160		3170 I		4,550		2,630		8,000	
Antimony	14	0.36		0.52 J		1.1 J		1.7 J		159		1.1 U 1		104		5.1 J		23.2		1.1 U 1		39.2		69		44.6	
Arsenic	20	2 J		2 J		1.6 J		2.9		19.1		1.9 I		7.8		5.6		12.6		1.7 I		23.5		6.1		17.9	
Barium	700	15.7 J		28.3 J		19.5 J		17.6 J		2,940		22 U 1		22.3 J		122		52.5		23 U 1		771		39.5 J		504	
Beryllium	2	0.07 J		0.21 J		0.13 J		0.05 U		0.23 J		0.54 U 1		0.04 U		0.43 J		0.51 U		0.57 U 1		0.2 J		0.1 J		0.2 J	
Cadmium	39	0.06 U		0.17 J		0.06 U		0.46 J		27.6		0.54 U 1		0.17 J		6.7		1.1		0.57 U 1		33.3		5.4		13.1	
Copper	600	3.7 J		4.3 J		8.6		12.4		2,590		4.2 I		39.4		1,790		145		5.1 I		1,810		66.3		1,260	
Iron	NC	6,090		5,800 J		4,600		4,500		72,800		5900 I		2,660		38,900		22900		5080 I		156,000		8,070		100,000	
Lead	400	3.6		8.5		21.9		48.5		16,420		4.1 I		7,070		756		9310		9.7 I		2,950		3,950		3,080	
Manganese	NC	33.3		154		54.3		18.3		572		41 I		737		359		110		35.8 I		711		99.4		584	
Mercury	14	0.06 J		0.1		0.09 J		0.06 J		22.3		0.032 U 1		0.06 J		1.3		0.35		0.034 U 1		4.2		1.7		4.9	
Nickel	250	3.2 J		14.6		3.4 J		3.2 J		249		4.3 U 1		0.86 J		249		13.7		4.6 U 1		294		8.5 J		110	
Silver	110	0.15 U		0.15 U		0.15 U		0.16 U		1.9 J		1.1 U 1		0.28 J		2.2 J		1 U		1.1 U 1		1.4 J		0.26 J		2.4	
Sodium	NC	18 U		37.4 U		42.1 J		19.9 U		172 J		540 U 1		32.3 J		402 J		510 U		570 U 1		753 J		63.4 J		695 J	
Thallium	2	0.75 U		0.78 U		0.75 U		0.83 U		2.6		1.1 U 1		0.78 U		0.95 J		1 U		1.1 U 1		0.78 U		0.78 U		5.9	
Zinc	1,500	15		71.7		16.6		150		16,200		22.4 I		22.6		924		331		13.2 I		7,550		176		4,080	
Soil Characteristics		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
pH	NC	7.7		7.8		5.9		7.4		7		NA		1		5.6		7.8		NA		7.2		7.5		7.6	
Cyanide (mg/kg)	NC	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

Notes:

- * NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-2
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-12	GP-12	GP-12	GP-13	GP-14	GP-14	GP-15	GP-16	GP-17	GP-18	GP-19	GP-20				
SAMPLE ID		GP-12A	OPDUP1	GP 12D	GP-13A	GP-14A	GP 14D	GP-15A	GP-16A	GP-17A	GP-18A	GP-19A	GP-20A				
LAB ID		N1314-2	N1313-10	N12322-8	N1314-5	N1314-8	N12322-10	N1314-11	N1315-3	N1315-6	N1315-9	N1313-1	N1313-4				
DATE		10/23/2001	10/23/2001	4/11/2002	10/23/2001	10/23/2001	4/11/2002	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001				
SAMPLE INTERVAL (BGS)		0-1	0-1	1.5 - 2	0-0.5	0.3-0.8	1.5 - 2	0.3-0.8	0.3-0.8	0.5-1	0-0.5	0.5-1	0.5-1				
ANALYTE	NJDEP																
Pesticide & PCB	Residential	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D				
Dieldrin	0.042	0.0039 U	1	0.0037 U	1	NA	0.0038 U	1	0.0038 U	1	0.0034 U	1	0.0039 U	1			
Aroclor 1242	0.49	0.039 U	1	0.037 U	1	0.017 U	1	0.038 U	1	0.039 U	1	0.034 U	1	0.039 U	1		
Aroclor 1248	0.49	0.039 U	1	0.037 U	1	0.017 U	1	0.038 U	1	0.039 U	1	0.034 U	1	0.039 U	1		
Aroclor 1254	0.49	3.7 D	10	3.3 D	10	2.08 D	5	2.1 D	10	0.038 U	1	0.017 U	1	5.2 D	20		
Aroclor 1260	0.49	3.1 D	10	3.2 D	10	3.52 D	5	0.72 D	10	36 D	42.9 D	30	7.4 D	20	3 D	10	
Total Aroclor	0.49	3.1 D	10	3.2 D	10	3.52 D	5	0.72 D	10	36 D	42.9 D	30	7.4 D	20	3 D	10	
Metals		Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D				
Aluminum	NC	NA		NA		3,940	1	NA		3,670	1	NA		NA		NA	
Antimony	14	NA		NA		4.3	1	NA		1.3	1	NA		NA		NA	
Arsenic	20	NA		NA		7.9	1	NA		4.8	1	NA		NA		NA	
Barium	700	NA		NA		144	1	NA		125	1	NA		NA		NA	
Beryllium	2	NA		NA		0.56 U	1	NA		0.52 U	1	NA		NA		NA	
Cadmium	39	NA		NA		9.2	1	NA		1.9	1	NA		NA		NA	
Copper	600	NA		NA		485	1	NA		117	1	NA		NA		NA	
Iron	NC	NA		NA		42500	1	NA		21000	1	NA		NA		NA	
Lead	400	NA		NA		644	1	NA		47	1	NA		NA		NA	
Manganese	NC	NA		NA		273	1	NA		234	1	NA		NA		NA	
Mercury	14	NA		NA		1.7	3	NA		0.55	1	NA		NA		NA	
Nickel	250	NA		NA		35.2	1	NA		19.8	1	NA		NA		NA	
Silver	110	NA		NA		1.1 U	1	NA		1 U	1	NA		NA		NA	
Sodium	NC	NA		NA		560 U	1	NA		520 U	1	NA		NA		NA	
Thallium	2	NA		NA		1.1 U	1	NA		1 U	1	NA		NA		NA	
Zinc	1,500	NA		NA		1080	1	NA		375	1	NA		NA		NA	
Soil Characteristics		Result <th>Q D</th> <th>Result</th> <th>Q D</th> <th>Result</th> <th>Q D</th> <th>Result</th> <th>Q D</th> <th>Result</th> <th>Q D</th> <th>Result</th> <th>Q D</th>	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D				
pH	NC	7.57	1	7.3	1	NA	1	7.6	1	7.56	1	7.97	1	7.52	1	6.8	1
Cyanide (mg/kg)	NC	NA		NA		NA		NA		NA		NA		NA		NA	

Notes:

- * NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
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- J = Estimated value, below the CRQL.
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TABLE 5-2
Matteo Iron and Metal

Surface Soil Sample Results (0-2 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-21	GP-22	GP-23	GP-24	GP-24	GP-25	GP-25	GP-26	GP-27	GP-28	GP-29	GP-29	GP-30																										
SAMPLE ID		GP-21A	GP-22A	GP-23A	GP-24A	GP-24D	GP-25A	GP-25D	GP-26A	GP-27A	GP-28A	GP-29A	GP-DUP3	GP-30A																										
LAB ID		N1313-7	N1314-14	N1405-1	N1405-4	N12322-12	N1405-7	N12322-14	N1405-10	N1405-13	N1405-15	N1405-18	N1409-7	N1409-1																										
DATE		10/23/2001	10/23/2001	10/24/2001	10/24/2001	4/11/2002	10/24/2001	4/11/2002	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001																										
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0.3-0.8	0.5-1	1.5-2	0.5-1	1.5-2	2	0-0.5	0-0.5	1-1.5	1-1.5	0-0.5																										
ANALYTE																																								
Pesticide & PCB																																								
		NJDEP Residential		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D													
Dieldrin		0.042	0.0038	U	1	0.0038	U	1	0.0041	U	1	0.0039	U	1	NA	0.0042	U	1	NA	0.004	U	1	0.0038	U	1	0.0035	U	1	0.0035	U	1									
Aroclor 1242		0.49	0.038	U	1	0.038	U	1	0.041	U	1	0.039	U	1	0.017	U	0.042	U	1	18	U	1	0.04	U	1	0.038	U	1	0.037	U	1	0.035	U	1	0.036	U	1			
Aroclor 1248		0.49	0.038	U	1	0.038	U	1	0.041	U	1	0.039	U	1	0.017	U	0.042	U	1	18	U	1	0.04	U	1	0.038	U	1	0.036	U	1	0.037	U	1	0.035	U	1	0.036	U	1
Aroclor 1254		0.49	0.038	U	1	0.038	U	1	0.041	U	1	0.42	J	0.0493	0.042	U	1	18	U	1	0.32	1	0.038	U	0.036	U	1	0.037	U	1	0.035	U	1	2.6	DJ	10				
Aroclor 1260		0.49	0.049	J	1	0.049	J	1	0.049	J	1	0.039	U	0.0444	2.1	U	50	0.0195	1	0.04	U	1	0.038	U	0.036	U	1	0.037	U	1	0.035	U	1	0.89	DJ	10				
Total Aroclor		0.49	0.049	J	1	0.049	J	1	0.049	J	1	0.039	U	0.0937	0	0.0195	1	0.032	1	0	0	0	0	0	0	0	0	0	0	0	0	3.49	DJ	10						
Metals				Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D				
Aluminum		NC	NA	2,100	1	25,700	1	14,200	3650	6,710	1	3050	1	4,430	1	2,620	3,440	3,610	1	2,380	1	4,520	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
Antimony		14	NA	1 J	423	55.7	1	1.1	U	26.4	1	1 U	1	5.2 J	1	0.45 U	0.45 U	1.4 J	1	0.93 J	1	865	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
Arsenic		20	NA	2.6 J	20.4	10.7	4.6	15.2	1	1.4	J	14.5	1	1.7 J	3.4	3.1	2.7	1	55	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Barium		700	NA	14.8 J	1,510	1,160	51.5	529	1	21	U	66.3	1	15.8 J	20.3 J	20.6 J	13.6 J	1	166	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Beryllium		2	NA	0.09 J	0.12 J	0.13 J	0.53 U	0.21 J	0.52 U	0.21 J	0.06 J	0.14 J	0.17 J	0.1 J	0.09 J	1	5.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Cadmium		39	NA	0.12 J	11.2	7.7	1	12.1	0.52 U	2.2 J	0.06 U	0.17 J	0.12 J	0.07 U	5.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Copper		600	NA	5.1 J	2,870	887	42.6	725	3.7	121	4.3 J	4.9 J	3.4 J	3.2 J	1,350	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Iron		NC	NA	4,030	100,000	54,600	12500	69,300	3710	13,400	3,660	5,480	5,060	4,540	55,500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Lead		400	NA	85.5	1,910	10,900	158	3,880	3.8	440	12.4	21.6	161	44.5	20,700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Manganese		NC	NA	38.6	724	511	134	397	27	205	13.9	41.9	42.8	28.3	374	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Mercury		14	NA	0.06 J	5.1	1.8	0.23	3.7	0.034 U	0.66	0.04 U	0.04 J	0.04 U	0.03 U	2.5	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Nickel		250	NA	2.7 J	502	66	20.9	138	4.5	14.9	2.2 J	3.8 J	3.5 J	2.4 J	173	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Silver		110	NA	0.21 J	2.2 J	5.1	1.1 U	1.2 J	1 U	0.17 J	0.15 U	0.15 U	0.15 U	0.15 U	1.7 J	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Sodium		NC	NA	20.5 U	963 J	34.5 J	530 U	56.5 J	520 U	51.5 J	59.5 J	32.4 J	20.8 U	71.2 J	21.1 J	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Thallium		2	NA	NA	NA	NA	1.1 U	NA	1 U	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Zinc		1,500	NA	18.8	4,800	120	175	2,540	175	318	10.2	78.8	32.9	18.5	1830	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Soil Characteristics				Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D				
pH		NC	7.18	1	6.11	1	7.73	1	12.32	NA	7.76	1	NA	1	5.93	1	4.95	6.15	1	5.78	1	5.59	1	8.15	1	1	1	1	1	1	1	1	1	1	1	1				
Cyanide (mg/kg)		NC	NA	0.05 U	1	0.64	1	0.05 U	NA	0.38 J	1	NA	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U					

Notes:

- * NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
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- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-2
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-30	GP-31	GP-31	GP-32	GP-32	GP-32	GP-33	GP-33	HA-1	HA-1	HA-2	HA-3
SAMPLE ID		GP 30D	GP-31A	GP-DUP4	GP 32A	GP 32B	DUPE 01	GP 33A	GP 33B	HA-1A	OPDUP2	HA-2A	HA-3A
LAB ID		N12322-16	N1409-4	N1409-8	N12323-24	N16274-6	N12323-29	N12323-26	N16274-3	N1314-12	N1313-11	N1529-1	N1529-3
DATE		4/11/2002	10/24/2001	10/24/2001	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	10/23/2001	10/23/2001	10/26/2001	10/26/2001
SAMPLE INTERVAL (BGS)		1.5 - 2	0.3-0.8	0.3-0.8	0.5 - 1	1.5 - 2	1.5 - 2	0.5 - 1	1.5 - 2	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE	NUDEP	Result		Result		Result		Result		Result		Result	
Pesticide & PCB	Residential	Q	D	Q	D	Q	D	Q	D	Q	D	Q	D
Dieldrin	0.042	NA		0.0037 U	1	0.0036 U		NA		0.004 U	1	0.0036 U	1
Aroclor 1242	0.49	17 U	1	0.037 U	1	0.036 U		17 U	1	0.018 U	1	35 U	1
Aroclor 1248	0.49	17 U	1	0.037 U	1	0.036 U		17 U	1	0.018 U	1	35 U	1
Aroclor 1254	0.49	0.327	1	0.43 J	1	0.3	J	0.321	1	1.06	2	35 U	1
Aroclor 1260	0.49	17 U	1	0.48 J	1	0.38		17 U	1	1.32	2	35 U	1
Total Aroclor	0.49	0.327	1	0.91	1	0.68		0.321	1	2.38	2	35 U	1
Metals		Result		Result		Result		Result		Result		Result	
Aluminum	NC	4,020	1	4,040	1	3,540		3,500	1	1,920		3,200	1
Antimony	14	5.7	1	169	1	34		4.8	1	0.63 J		1.1 U	1
Arsenic	20	2.2	1	222	1	9.9		5.9	1	0.68 U		1.6	1
Barium	700	37	1	99.8	1	129		88.1	1	11.3 J		21 U	1
Beryllium	2	0.57 U	1	0.08 J	1	0.15 J		0.47 U	1	0.13 J		0.53 U	1
Cadmium	39	0.57 U	1	2.4	1	4.6		1.4	1	0.08 U		0.53 U	1
Copper	600	89.6	1	483	1	523		438	1	7.3		9.9	1
Iron	NC	5530	1	14,900	1	19,600		17600	1	3750		4870	1
Lead	400	392	1	7,600	1	2,440		3350	1	2.6		8.2	1
Manganese	NC	72.1	1	82.3	1	208		134	1	13.3		20.6	1
Mercury	14	0.11	1	1.5	1	0.83		1.3	3	0.03 U		0.032 U	1
Nickel	250	5.8	1	32.1	1	64.6		13.1	1	1.8 J		4.3 U	1
Silver	110	1.1 U	1	0.7 J	1	0.15 U		0.94 U	1	0.14 U		1.1 U	1
Sodium	NC	570 U	1	71.1 J	1	21.1 U		470 U	1	95.1 J		530 U	1
Thallium	2	1.1 U	1	NA		NA		0.94 U	1	0.93 U		1.1 U	1
Zinc	1,500	248	1	562	1	1,320		317	1	6.7		110	1
Soil Characteristics		Result		Result		Result		Result		Result		Result	
pH	NC	NA	1	5.15	1	6.2		NA	1	NA		7.71	1
Cyanide (mg/kg)	NC	NA		0.44 B	1	0.05		NA		0.05 U		NA	

Notes:

- * NUDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-2
Matteo Iron and Metal

Surface Soil Sample Results (0-2 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		HA-4A	HA-5A	HA-6A	HA-7A	HA-8A	HA-8B	HA-9A	HA-10A	HA-10B	HA-11A	HA-12A	HA-12B	HA-13A								
SAMPLE ID		HA 4A	HA 5A	HA 6A	HA 7A	HA 8A	HA 8B	HA 9A	HA 10A	HA 10B	HA 11A	HA 12A	HA 12B	HA 13A								
LAB ID		N12323-1	N12323-3	N12323-5	N12323-7	N12323-9	N16274-9	N12323-11	N12323-13	N16274-7	N12323-15	N12323-17	N16274-7	N12323-19								
DATE		4/11/2002	4/11/2002	4/11/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002								
SAMPLE INTERVAL (BGS)		0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5								
ANALYTE	NJDEP																					
Pesticide & PCB	Residential	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Dieldrin	0.042	NA			NA			NA			NA			NA			NA			NA		
Aroclor 1242	0.49	0.017	U	1	0.017	U	1	0.017	U	1	0.018	U	1	0.039	U	1	0.017	U	1	0.02	U	1
Aroclor 1248	0.49	0.017	U	1	0.017	U	1	0.017	U	1	0.018	U	1	0.039	U	1	0.017	U	1	0.02	U	1
Aroclor 1254	0.49	0.086	1		0.16	1		0.252			0.018	U	1	0.018	U	1	0.11	1		0.071	1	
Aroclor 1260	0.49	0.039	1		0.0701	1		0.017	U	1	0.018	U	1	0.21	J	1	0.017	U	1	0.02	U	1
Total Aroclor	0.49	0.125			0.2301			0.252			0		2.23			0.32			0.071		6.74	
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Aluminum	NC	NA			NA			NA			NA			NA			NA			NA		
Antimony	14	NA			NA			NA			NA			NA			NA			NA		
Arsenic	20	NA			NA			NA			NA			NA			NA			NA		
Barium	700	NA			NA			NA			NA			NA			NA			NA		
Beryllium	2	NA			NA			NA			NA			NA			NA			NA		
Cadmium	39	NA			NA			NA			NA			NA			NA			NA		
Copper	600	NA			NA			NA			NA			NA			NA			NA		
Iron	NC	NA			NA			NA			NA			NA			NA			NA		
Lead	400	NA			NA			NA			NA			NA			NA			NA		
Manganese	NC	NA			NA			NA			NA			NA			NA			NA		
Mercury	14	NA			NA			NA			NA			NA			NA			NA		
Nickel	250	NA			NA			NA			NA			NA			NA			NA		
Silver	110	NA			NA			NA			NA			NA			NA			NA		
Sodium	NC	NA			NA			NA			NA			NA			NA			NA		
Thallium	2	NA			NA			NA			NA			NA			NA			NA		
Zinc	1,500	NA			NA			NA			NA			NA			NA			NA		
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
pH	NC	NA	1		NA	1		NA	1		6.98			NA	1		6.78			5.28	1	
Cyanide (mg/kg)	NC	NA			NA			NA			NA			NA			NA			NA		

Notes:

- NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-3
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-01	GP-02	GP-03	GP-04	GP-05	GP-06	GP-07	GP-08	GP-09	GP-10
SAMPLE ID		GP-01A	GP-02A	GP-03A	GP-04A	GP-05A	GP-06A	GP-07A	GP-08A	GP-09A	GP-10A
LAB ID		E76579-1	E76579-3	E76579-5	E76579-7	E76579-9	N12323-21	E76579-11	E76579-13	N12322-6	E76579-17
DATE		9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	1.5 - 2	0-0.5	0-0.5	1.5 - 2	0-0.5
ANALYTE		NJDEP Non-Residential		Result		Result		Result		Result	
Pesticide & PCB		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Dieldrin		0.18	0.0034 U	0.017 U	0.0035 U	0.019 U	0.0041 U	NA	0.0035 U	0.038 U	NA
Aroclor 1242		2	0.034 U	0.17 U	0.035 U	0.19 U	0.041 U	0.017 U	0.035 U	0.38 U	0.018 U
Aroclor 1248		2	0.034 U	0.17 U	0.035 U	0.19 U	0.041 U	0.017 U	0.035 U	0.38 U	0.018 U
Aroclor 1254		2	0.079 U	0.19 U	0.035 U	0.19 U	0.041 U	0.017 U	0.035 U	0.38 U	0.018 U
Aroclor 1260		2	0.034 U	0.17 U	0.035 U	0.19 U	0.041 U	0.017 U	0.035 U	0.38 U	0.018 U
Total Aroclor		2	0.079 U	0.19 U	0.035 U	0.19 U	0.041 U	0.017 U	0.035 U	0.38 U	0.018 U
Metals		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum		NC	2,980	3,930	3,450	2,250	5,130	3,290	901	8,040	3,160
Antimony		340	0.36	0.52 J	1.1 J	1.7 J	159	1.1 U	104	5.1 J	23.2
Arsenic		20	2 J	2 J	1.6 J	2.9	19.1	1.9 J	7.8	5.6	12.6
Barium		47,000	15.7 J	28.3 J	19.5 J	17.6 J	2,940	22 U	122	52.5	23 U
Beryllium		2	0.07 J	0.21 J	0.13 J	0.05 U	0.23 J	0.54 U	0.04 U	0.43 J	0.51 U
Cadmium		100	0.06 U	0.17 J	0.06 U	0.46 J	27.6	0.54 U	0.17 J	6.7	1.1
Copper		600	3.7 J	4.3 J	8.6	12.4	2,590	4.2 J	39.4	1,790	145
Iron		NC	6,090	5,800 J	4,600	4,500	72,800	5,900	2,660	38,900	22,900
Lead		600	3.6	8.5	21.9	48.5	6,420	4.1 J	7,070	756	9310
Manganese		NC	33.3	154	54.3	18.3	572	41 J	737	359	110
Mercury		270	0.06 J	0.1	0.09 J	0.06 J	22.3	0.032 U	0.06 J	1.3	0.35
Nickel		2,400	3.2 J	14.6	3.4 J	3.2 J	249	4.3 U	0.86 J	249	13.7
Silver		4,100	0.15 U	0.15 U	0.15 U	0.16 U	1.9 J	1.1 U	0.28 J	2.2 J	1 U
Sodium		NC	18 U	37.4 J	42.1 J	19.9 U	172 J	540 U	32.3 J	402 J	510 U
Thallium		2	0.75 U	0.78 U	0.75 U	0.83 U	2.6	1.1 U	0.78 U	0.95 J	1 U
Zinc		1,500	15	71.7	16.6	150	16,200	22.4 J	22.6	924	331
Soil Characteristics		Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
pH		NC	7.7	7.8	5.9	7.4	7	NA	5.6	7.8	NA
Cyanide (mg/kg)		NC	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

- NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-3
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-12	GP-12	GP-12	GP-13	GP-14	GP-14	GP-15	GP-16	GP-17	GP-18	GP-19	GP-20																
SAMPLE ID		GP-12A	GP-12B	GP-12D	GP-13A	GP-14A	GP-14D	GP-15A	GP-16A	GP-17A	GP-18A	GP-19A	GP-20A																
LAB ID		N1314-2	N1313-10	N12322-8	N1314-5	N1314-8	N12322-10	N1314-11	N1315-3	N1315-6	N1315-9	N1313-1	N1313-4																
DATE		10/23/2001	10/23/2001	4/11/2002	10/23/2001	10/23/2001	4/11/2002	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001																
SAMPLE INTERVAL (BGS)		0-1	0-1	1.5 - 2	0-0.5	0.3-0.8	1.5 - 2	0.3-0.8	0.3-0.8	0.5-1	0-0.5	0.5-1	0.5-1																
ANALYTE		NJDEP Non-Residential																											
Pesticide & PCB		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D										
Dieldrin		0.18	0.0039	U	1	0.0037	U	1	NA	0.0038	U	1	0.0034	U	1	0.0035	U	1	0.0036	U	1	0.0040	U	1	0.0039	U	1		
Aroclor 1242		2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.039	U	1	0.034	U	1	0.036	U	1	0.04	U	1	0.039	U	1
Aroclor 1248		2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.039	U	1	0.034	U	1	0.035	U	1	0.036	U	1	0.04	U	1
Aroclor 1254		2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.039	U	1	0.034	U	1	0.035	U	1	0.036	U	1	0.04	U	1
Aroclor 1260		2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.039	U	1	0.034	U	1	0.035	U	1	0.036	U	1	0.04	U	1
Total Aroclor		2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.039	U	1	0.034	U	1	0.035	U	1	0.036	U	1	0.04	U	1
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
Aluminum		NC	NA	NA	NA	3,940	1	NA	NA	3,670	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Antimony		340	NA	NA	NA	4.3	1	NA	NA	1.3	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Arsenic		20	NA	NA	NA	7.9	1	NA	NA	4.8	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Barium		47,000	NA	NA	NA	144	1	NA	NA	125	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Beryllium		2	NA	NA	NA	0.56	U	1	NA	NA	0.52	U	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cadmium		100	NA	NA	NA	9.2	1	NA	NA	1.9	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Copper		600	NA	NA	NA	485	1	NA	NA	117	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Iron		NC	NA	NA	NA	41500	1	NA	NA	21000	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Lead		600	NA	NA	NA	644	1	NA	NA	471	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Manganese		NC	NA	NA	NA	273	1	NA	NA	234	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Mercury		270	NA	NA	NA	1.7	3	NA	NA	0.55	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Nickel		2,400	NA	NA	NA	35.2	1	NA	NA	19.8	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Silver		4,100	NA	NA	NA	1.1	U	1	NA	NA	1	U	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sodium		NC	NA	NA	NA	560	U	1	NA	NA	520	U	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Thallium		2	NA	NA	NA	1.1	U	1	NA	NA	1	U	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Zinc		1,500	NA	NA	NA	1080	1	NA	NA	375	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
pH		NC	7.57	1	7.3	1	NA	1	7.6	1	7.56	1	7.97	1	7.52	1	6.8	1	7.68	1	7.99	1	7.17	1					
Cyanide (mg/kg)		NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

- Notes:
- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
 - Shaded values exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.
 - D = Sample diluted.
 - NA = Not Available.

TABLE 5-3
Matteo Iron and Metal

Surface Soil Sample Results (0-2 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-21	GP-22	GP-23	GP-24	GP-24	GP-25	GP-25	GP-26	GP-27	GP-28	GP-29	GP-29	GP-30													
SAMPLE ID		GP-21A	GP-22A	GP-23A	GP-24A	GP-24D	GP-25A	GP-25D	GP-26A	GP-27A	GP-28A	GP-29A	GP-29P3	GP-30A													
LAB ID		N1313-7	N1314-14	N1405-1	N1405-4	N12322-12	N1405-7	N12322-14	N1405-10	N1405-13	N1405-15	N1405-18	N1409-7	N1409-1													
DATE		10/23/2001	10/23/2001	10/24/2001	10/24/2001	4/11/2002	10/24/2001	4/11/2002	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001													
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0.3-0.8	0.5-1	1.5 - 2	0.5-1	1.5 - 2	2	0-0.5	0-0.5	1-1.5	1-1.5	0-0.5													
ANALYTE	NJDEP Non-Residential Criteria (NRSCC)																										
Pesticide & PCB	Residential	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D												
Dieldrin	0.18	0.0038 U	1	0.0038 U	1	0.0041 U	1	0.0039 U	NA	0.0042 U	1	NA	0.004 U	0.0038 U	0.0035 U	1	0.0037 U	1	0.0035 U	1	0.0035 U	1	0.0035 U	1			
Aroclor 1242	2	0.038 U	1	0.038 U	1	0.041 U	1	0.039 U	0.017 U	0.042 U	1	18 U	1	0.04 U	1	0.038 U	0.036 U	1	0.037 U	1	0.035 U	1	0.035 U	1			
Aroclor 1248	2	0.038 U	1	0.038 U	1	0.041 U	1	0.039 U	0.017 U	0.042 U	1	18 U	1	0.04 U	1	0.038 U	0.036 U	1	0.037 U	1	0.035 U	1	0.035 U	1			
Aroclor 1254	2	0.038 U	1	0.038 U	1	0.041 U	1	0.039 U	0.0493	0.042 U	1	18 U	1	0.32	1	0.038 U	0.036 U	1	0.037 U	1	0.035 U	1	0.035 U	1			
Aroclor 1260	2	0.038 U	1	0.049 J	1	0.044	1	0.039 U	0.0444	2.1 U	50	0.0195	1	0.04 U	1	0.038 U	0.036 U	1	0.037 U	1	0.035 U	1	0.035 U	1			
Total Aroclor	2	0.049	1	0.049	1	1.29	1	0.0937	1	0	1	0.0195	1	0.32	1	0	1	0	1	0	1	0	1	0.89	1		
Metals		Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D		
Aluminum	NC	NA		2,100	1	25,700	1	14,200		3650		6,710	1	3050	1	4,430	1	2,620		3,440	1	3,610	1	2,380	1	4,520	1
Antimony	340	NA		1 J	1	42.3	1	55.7	1	1.1 U		26.4	1	1 U	1	5.2 J	1	0.45 U		0.45 U	1	1.4 J	1	0.93 J	1	865	1
Arsenic	20	NA		2.6	1	20.4	1	10.7		4.6		15.2	1	1.4	1	14.5	1	1.7 J		3.4	1	3.1	1	2.7	1	55	1
Barium	47,000	NA		14.8 J	1	1,510	1	1,160		51.5		529	1	21 U	1	66.3	1	15.8 J		20.3 J	1	20.6 J	1	13.6 J	1	166	1
Beryllium	2	NA		0.09 J	1	0.12 J	1	0.13 J		0.53 U		0.21 J	1	0.52 U	1	0.21 J	1	0.06 J		0.14 J	1	0.17 J	1	0.1 J	1	0.09 J	1
Cadmium	100	NA		0.12 J	1	11.2	1	7.7		1		12.1	1	0.52 U	1	2.2		0.06 U		0.17 J	1	0.12 J	1	0.07 U	1	5.7	1
Copper	600	NA		5.1 J	1	2,870	1	2,887		42.6		725	1	3.7	1	121	1	4.3 J		4.9 J	1	3.4 J	1	3.2 J	1	1,350	1
Iron	NC	NA		4,030	1	100,000	1	54,600		12500		69,300	1	3710	1	13,400	1	3,660		5,480	1	5,060	1	4,540	1	55,500	1
Lead	600	NA		85.5	1	10,900	1	10,900		158		3,880	1	3.8	1	440	1	12.4		21.6	1	161	1	44.5	1	20,700	1
Manganese	NC	NA		38.6	1	724	1	511		134		397	1	27	1	205	1	13.9		41.9	1	42.8	1	28.3	1	374	1
Mercury	270	NA		0.06 J	1	5.1	1	1.8		0.23		3.7	1	0.034 U	1	0.66	1	0.04 U		0.04 J	1	0.04 U	1	0.03 U	1	2.5	1
Nickel	2,400	NA		2.7 J	1	502	1	66		20.9		138	1	4.5	1	14.9	1	2.2 J		3.8 J	1	3.5 J	1	2.4 J	1	173	1
Silver	4,100	NA		0.21 J	1	2.2 J	1	5.1		1.1 U		1.2 J	1	1 U	1	0.17 J	1	0.15 U		0.15 U	1	0.15 U	1	0.15 U	1	1.7 J	1
Sodium	NC	NA		20.5 U	1	963 J	1	34.5 J		530 U		56.5 J	1	520 U	1	51.5 J	1	59.5 J		32.4 J	1	28.8 U	1	71.2 J	1	21.1 J	1
Thallium	2	NA		NA		NA		NA		1.1 U		NA		1 U	1	NA		NA		NA		NA		NA		NA	
Zinc	1,500	NA		18.8	1	4,800	1	2,120		175		2,540	1	175	1	318	1	10.2		78.8	1	32.9	1	18.5	1	1,830	1
Soil Characteristics		Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D
pH	NC	7.18	1	6.11	1	7.73	1	12.32		NA		7.76	1	NA	1	5.93	1	4.95		6.15	1	5.78	1	5.59	1	8.15	1
Cyanide (mg/kg)	NC	NA		0.05 U	1	0.64	1	0.05 U		NA		0.38 J	1	NA	1	0.05 U	1	0.05 U		0.05 U	1	0.05 U	1	0.05 U	1	0.05 U	1

Notes:

- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- I = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-3
Matteo Iron and Metal

Surface Soil Sample Results (0-2 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-30	GP-31	GP-31	GP-32	GP-32	GP-32	GP-33	GP-33	HA-1	HA-1	HA-2	HA-3			
SAMPLE ID		GP 30D	GP-31A	GP-DUP4	GP 32A	GP 32B	DUPE 01	GP 33A	GP 33B	HA-1A	GPDUP2	HA-2A	HA-3A			
LAB ID		N12322-16	N1409-4	N1409-8	N12323-24	N16274-6	N12323-29	N12323-26	N16274-3	N1314-12	N1313-11	N1529-1	N1529-3			
DATE		4/11/2002	10/24/2001	10/24/2001	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	10/23/2001	10/23/2001	10/26/2001	10/26/2001			
SAMPLE INTERVAL (BGS)		1.5 - 2	0.3-0.8	0.3-0.8	0.5 - 1	1.5 - 2	1.5 - 2	0.5 - 1	1.5 - 2	0-0.5	0-0.5	0-0.5	0-0.5			
ANALYTE	NJDEP Non-Residential	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Pesticide & PCB																
Dieldrin	0.18	NA			0.0037 U	I		0.0036 U	NA		0.004 U	I	0.0036 U	I	0.0046	I
Aroclor 1242	2	17 U	I		0.037 U	I		0.036 U	17 U	I	0.018 U	I	0.036 U	I	0.035 U	I
Aroclor 1248	2	17 U	I		0.037 U	I		0.036 U	17 U	I	0.018 U	I	0.036 U	I	0.035 U	I
Aroclor 1254	2	0.327	I		0.43 J	I		0.3	J	0.321	I	NA	17 U	I	1.06	2
Aroclor 1260	2	17 U	I		0.48 J	I		0.38		17 U	I	NA	17 U	I	1.32	2
Total Aroclor	2	0.327	I		0.91			0.68		0.321	NA		0		2.38	2
Metals																
Aluminum	NC	4,020	I		4,040	I		3,540		3,500	I	1,920		3,200	I	
Antimony	340	5.7	I		169	I		34		24.8	I	0.63 J		1.1 U	I	
Arsenic	20	2.2	I		22.2	I		9.9		5.9	I	0.68 U		1.6	I	
Barium	47,000	37	I		99.8	I		129		88.1	I	11.3 J		21 U	I	
Beryllium	2	0.57 U	I		0.08 J	I		0.15	J	0.47 U	I	0.13 J		0.53 U	I	
Cadmium	100	0.57 U	I		2.4	I		4.6		1.4	I	0.08 U		0.53 U	I	
Copper	600	89.6	I		483	I		523		438	I	7.3		9.9	I	
Iron	NC	5530	I		14,900	I		19,600		17,600	I	3750		4,870	I	
Lead	600	594	I		7,860	I		2,440		3,350	I	2.6		8.2	I	
Manganese	NC	72.1	I		82.3	I		208		134	I	13.3		20.6	I	
Mercury	270	0.11	I		1.5	I		0.83		1.3	J	0.03 U		0.032 U	I	
Nickel	2,400	5.8	I		32.1	I		64.6		13.1	I	1.8 J		4.3 U	I	
Silver	4,100	1.1 U	I		0.7 J	I		0.15	U	0.94 U	I	0.14 U		1.1 U	I	
Sodium	NC	570 U	I		71.1 J	I		21.1	U	470 U	I	95.1 J		530 U	I	
Thallium	2	1.1 U	I		NA			NA		0.94 U	I	0.93 U		1.1 U	I	
Zinc	1,500	248	I		562	I		1,320		317	I	6.7		110	I	
Soil Characteristics																
pH	NC	NA	I		5.15	I		6.2		NA	I	NA		NA	I	
Cyanide (mg/kg)	NC	NA	I		0.44 B	I		0.05		NA	I	0.05 U		NA	I	

Notes:

- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-3
Matteo Iron and Metal

Surface Soil Sample Results (0-2 ft) from the Scrappyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		HA-4A	HA-5A	HA-6A	HA-7A	HA-8A	HA-8B	HA-9A	HA-10A	HA-10B	HA-11A	HA-12A	HA-12B	HA-13A		
SAMPLE ID		HA 4A	HA 5A	HA 6A	HA 7A	HA 8A	HA 8B	HA 9A	HA 10A	HA 10B	HA 11A	HA 12A	HA 12B	HA 13A		
LAB ID		N12323-1	N12323-3	N12323-5	N12323-7	N12323-9	N16274-9	N12323-11	N12323-13	N16274-7	N12323-15	N12323-17	N16274-7	N12323-19		
DATE		4/11/2002	4/11/2002	4/11/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002		
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5		
ANALYTE	NJDEP Non-Residential	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Pesticide & PCB		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Dieldrin	0.18	NA			NA			NA			NA			NA		
Aroclor 1242	2	0.017 U	I		0.017 U	I		0.018 U	I		0.018 U	I		0.039 U	I	
Aroclor 1248	2	0.017 U	I		0.017 U	I		0.017 U	I		0.018 U	I		0.039 U	I	
Aroclor 1254	2	0.086 J			0.16 J			0.252			0.018 U	I		0.018 U	I	
Aroclor 1260	2	0.039 J			0.070 J			0.017 U			0.018 U	I		2	5	
Total Aroclor	2	0.125			0.230 J			0.252			0			0.21 J		
											0.32			0.071		
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Aluminum	NC	NA			NA			NA			NA			NA		
Antimony	340	NA			NA			NA			NA			NA		
Arsenic	20	NA			NA			NA			NA			NA		
Barium	47,000	NA			NA			NA			NA			NA		
Beryllium	2	NA			NA			NA			NA			NA		
Cadmium	100	NA			NA			NA			NA			NA		
Copper	600	NA			NA			NA			NA			NA		
Iron	NC	NA			NA			NA			NA			NA		
Lead	600	NA			NA			NA			NA			NA		
Manganese	NC	NA			NA			NA			NA			NA		
Mercury	270	NA			NA			NA			NA			NA		
Nickel	2,400	NA			NA			NA			NA			NA		
Silver	4,100	NA			NA			NA			NA			NA		
Sodium	NC	NA			NA			NA			NA			NA		
Thallium	2	NA			NA			NA			NA			NA		
Zinc	1,500	NA			NA			NA			NA			NA		
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
pH	NC	NA	I		NA	I		NA	I		8.98			NA	I	
Cyanide (mg/kg)	NC	NA			NA			NA			NA			NA		

Notes:

- NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-4
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION		GP-01	GP-02	GP-03	GP-04	GP-05	GP-05	GP-06	GP-07	GP-07	GP-07	GP-08	GP-09	GP-10	
SAMPLE ID		GP-01A	GP-02A	GP-03A	GP-04A	GP-05A	GP-5C	GP-06A	GP-07A	GP-7C	DUPE 02	GP-08A	GP-09A	GP-10A	
LAB ID		E76579-1	E76579-3	E76579-5	E76579-7	E76579-9	N12323-21	E76579-11	E76579-13	N12322-6	N12323-30	E72117-15	E76579-17	E76579-19	
DATE		9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	4/11/2002	9/11/2000	9/11/2000	4/11/2002	4/11/2002	6/28/2000	9/11/2000	9/11/2000	
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	1.5 - 2	0-0.5	0-0.5	1.5 - 2	1.5 - 2	0-0.5	0-0.5	0-0.5	
ANALYTE	NJDEP IGW	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Pesticide & PCB															
Dieldrin	50	0.0034 U		0.017 U		0.0035 U		0.019 U		0.0041 U		NA		0.0036 U	
Aroclor 1242	50	0.034 U		0.17 U		0.035 U		0.19 U		0.041 U		0.017 U I		0.036 U	
Aroclor 1248	50	0.034 U		0.17 U		0.035 U		0.19 U		0.041 U		0.017 U I		0.036 U	
Aroclor 1254	50	0.079		0.035 U		0.035 U		3		0.7		0.017 U I		0.035 U	
Aroclor 1260	50	0.034 U		26 DJ		0.035 U		0.6		0.18		0.017 U I		0.035 U	
Total Aroclor	50	0.079		2163 DJ		0.035 U		3.6		0.88		0		0.035 U	
Metals															
Aluminum	NC	2,980		3,930		3,450		2,250		5,130		3,290 I		901	
Antimony	(h)	0.36		0.52 J		1.1 J		1.7 J		159		1.1 U I		104	
Arsenic	(b)	2 J		2 J		1.6 J		2.9		19.1		1.9 I		7.8	
Barium	(h)	15.7 J		28.3 J		19.5 J		17.6 J		2,940		22 U I		22.3 J	
Beryllium	(b)	0.07 J		0.21 J		0.13 J		0.05 U		0.23 J		0.54 U I		0.04 U	
Cadmium	(b)	0.06 U		0.17 J		0.06 U		0.46 J		27.6		0.54 U I		0.17 J	
Copper	(h)	3.7 J		4.3 J		8.6		12.4		2,590		4.2 I		39.4	
Iron	NC	6,090		5,800 J		4,600		4,500		72,800		5900 I		2,660	
Lead	(h)	3.6		8.5		21.9		48.5		6,420		4.1 I		7,070	
Manganese	NC	33.3		154		54.3		18.3		572		41 I		737	
Mercury	(h)	0.06 J		0.1		0.09 J		0.06 J		22.3		0.032 U I		0.06 J	
Nickel	(b)	3.2 J		14.6		3.4 J		3.2 J		249		4.3 U I		0.86 J	
Silver	(b)	0.15 U		0.15 U		0.15 U		0.16 U		1.9 J		1.1 U I		0.28 J	
Sodium	NC	18 U		37.4 J		42.1 J		19.9 U		172 J		540 U I		32.3 J	
Thallium	(b)	0.75 U		0.78 U		0.75 U		0.83 U		2.6		1.1 U I		0.78 U	
Zinc	(h)	15		71.7		16.6		150		16,200		22.4 I		22.6	
Soil Characteristics															
pH	NC	7.7		7.8		5.9		7.4		7		NA I		5.6	
Cyanide (mg/kg)	NC	NA		NA		NA		NA		NA		NA		NA	

- Notes:
- NJDEP IGW = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
 - Shaded values exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99)
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.
 - D = Sample diluted.
 - NA = Not Available.

TABLE 5-4
Mateo Iron and Metal

Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION		Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)																		
SAMPLE ID		GP-12	GP-12	GP-12	GP-13	GP-14	GP-14	GP-15	GP-16	GP-17	GP-18	GP-19	GP-20							
LAB ID		N1314-2	N1313-10	N12322-8	N1314-5	N1314-8	N12322-10	N1314-11	N1315-3	N1315-6	N1315-9	N1313-1	N1313-4							
DATE		10/23/2001	10/23/2001	4/11/2002	10/23/2001	10/23/2001	4/11/2002	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001							
SAMPLE INTERVAL (BGS)		0-1	0-1	1.5-2	0-0.5	0.3-0.8	1.5-2	0.3-0.8	0.3-0.8	0.5-1	0-0.5	0.5-1	0.5-1							
ANALYTE	NJDEP IGW	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
Pesticide & PCB		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
Dieldrin	0.18	0.0039	U	1	0.0037	U	1	NA	0.0038	U	1	0.0038	U	1	0.0035	U	1	0.0036	U	1
Aroclor 1242	2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.039	U	1	0.034	U	1	
Aroclor 1248	2	0.039	U	1	0.037	U	1	0.017	U	1	0.038	U	1	0.038	U	1	0.039	U	1	
Aroclor 1254	2	3.7	D	10	3.3	D	10	2.08	S		2.1	D	10	0.038	U	1	0.017	U	1	
Aroclor 1260	2	3.1	D	10	3.2	D	10	3.52	S		0.72	D	10	36	D		42.9	S	50	
Total Aroclor	2	6.8			6.5			5.6			2.82			36			42.9			
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
Aluminum	NC	NA			NA			3,940	1		NA			NA			3,670	1		
Antimony	340	NA			NA			4.3	1		NA			NA			1.3	1		
Arsenic	20	NA			NA			7.9	1		NA			NA			4.8	1		
Barium	47,000	NA			NA			144	1		NA			NA			125	1		
Beryllium	2	NA			NA			0.56	U	1	NA			NA			0.52	U	1	
Cadmium	100	NA			NA			9.2	1		NA			NA			1.9	1		
Copper	600	NA			NA			485	1		NA			NA			117	1		
Iron	NC	NA			NA			42500	1		NA			NA			21000	1		
Lead	600	NA			NA			644	1		NA			NA			471	1		
Manganese	NC	NA			NA			273	1		NA			NA			234	1		
Mercury	270	NA			NA			1.7	3		NA			NA			0.55	1		
Nickel	2,400	NA			NA			35.2	1		NA			NA			19.8	1		
Silver	4,100	NA			NA			1.1	U	1	NA			NA			1	U	1	
Sodium	NC	NA			NA			560	U	1	NA			NA			520	U	1	
Thallium	2	NA			NA			1.1	U	1	NA			NA			1	U	1	
Zinc	1,500	NA			NA			1080	1		NA			NA			375	1		
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
pH	NC	7.57	1		7.3	1		NA	1		7.6	1		7.56	1		NA	1		
Cyanide (mg/kg)	NC	NA			NA			NA			NA			NA			NA			

Notes:

- * NJDEP IGW = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
- Shaded values exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-4
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)

Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)																										
SAMPLE LOCATION		GP-21	GP-22	GP-23	GP-24	GP-24	GP-25	GP-25	GP-26	GP-27	GP-28	GP-29	GP-29	GP-30												
SAMPLE ID		GP-21A	GP-22A	GP-23A	GP-24A	GP-24D	GP-25A	GP-25D	GP-26A	GP-27A	GP-28A	GP-29A	GP-DUP3	GP-30A												
LAB ID		N1313-7	N1314-14	N1405-1	N1405-4	N12322-12	N1405-7	N12322-14	N1405-10	N1405-13	N1405-15	N1405-18	N1409-7	N1409-1												
DATE		10/23/2001	10/23/2001	10/24/2001	10/24/2001	4/11/2002	10/24/2001	4/11/2002	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001												
SAMPLE INTERVAL (BGS)		0-0.5	0-0.5	0.3-0.8	0.5-1	1.5-2	0.5-1	1.5-2	2	0-0.5	0-0.5	1-1.5	1-1.5	0-0.5												
ANALYTE		NJDEP IGW																								
Pesticide & PCB		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D							
Dieldrin	0.18	0.0038	U	I	0.0038	U	I	0.0041	U	I	0.0039	U	NA	0.0042	U	I	NA	0.004	U	I						
Aroclor 1242	2	0.038	U	I	0.038	U	I	12	D	10	0.039	U	0.017	U	0.038	U	18	U	I	I						
Aroclor 1248	2	3.76	DJ	20	0.038	U	I	0.041	U	I	0.87	0.017	U	0.042	U	I	18	U	I	I						
Aroclor 1254	2	0.038	U	I	0.038	U	I	0.041	U	I	0.42	J	0.0493	0.042	U	I	18	U	I	I						
Aroclor 1260	2	6	D	20	0.049	J	I	2.2	D	10	0.039	U	0.0444	2.1	U	50	0.0195	I	0.04	U	I					
Total Aroclor	2	9.76			0.049			14.2			1.29		0.0937	0			0.0195		0.32		0					
																					0					
																					3.49					
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D				
Aluminum	NC	NA			2,100	I		25,700	I		14,200		3650		6,710	I		3050	I		4,430	I	2,620			
Antimony	340	NA			I	J	I	42.3	I		55.7		1.1	U	26.4	I		I	U	I	5.2	J	0.45	U		
Arsenic	20	NA			2.6	I		20.4	I		10.7		4.6		15.2	I		1.4	I	I	14.5	I	1.7	J		
Barium	47,000	NA			14.8	J	I	1,510	I		1,160		51.5		529	I		21	U	I	66.3	I	15.8	J		
Beryllium	2	NA			0.09	J	I	0.12	J	I	0.13	J	0.53	U	0.21	J	I	0.52	U	I	0.21	J	0.06	J		
Cadmium	100	NA			0.12	J	I	11.2	I		7.7		1		12.1	I		0.52	U	I	2.2	I	0.06	U		
Copper	600	NA			5.1	J	I	2,870	I		887		42.6		725	I		3.7	I	I	121	I	4.3	J		
Iron	NC	NA			4,030	I		100,000	I		54,600		12500		69,300	I		3710	I	I	13,400	I	3,660	5,480	I	
Lead	600	NA			85.5	I		1,910	I		10,900		158		3,880	I		3.8	I	I	440	I	12.4	21.6	I	
Manganese	NC	NA			38.6	I		724	I		511		134		397	I		27	I	I	205	I	13.9	41.9	I	
Mercury	270	NA			0.06	J	I	5.1	S		1.8		0.23		3.7	S		0.034	U	I	0.66	I	0.04	U		
Nickel	2,400	NA			2.7	J	I	502	I		66		20.9		138	I		4.5	I	I	14.9	I	2.2	J		
Silver	4,100	NA			0.21	J	I	2.2	J	I	5.1		1.1	U	1.2	J	I	I	U	I	0.17	J	0.15	U		
Sodium	NC	NA			20.5	U	I	963	J	I	34.5	J	530	U	56.5	J	I	520	U	I	51.5	J	59.5	J		
Thallium	2	NA			NA			NA			1.1	U	NA		I	U	I	NA		I	NA		NA	NA		
Zinc	1,500	NA			18.8	I		4,800	I		2,120		175		2,540	I		175	I	I	318	I	10.2	78.8	I	
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	
pH	NC	7.18	I		6.11	I		7.73	I		12.32		NA		7.76	I		NA		I	5.93	I	4.95		6.15	I
Cyanide (mg/kg)	NC	NA			0.05	U	I	0.64	I		0.05	U	NA		0.38	I	I	NA		I	0.05	U	0.05	U	0.05	U

- Notes:
- * NJDEP IGW = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
 - Shaded values exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.
 - D = Sample diluted.
 - NA = Not Available.

TABLE 5-4
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION	OP-30	OP-31	GP-31	GP-32	GP-32	GP-32	GP-33	GP-33	HA-1	HA-1	HA-2	HA-3
SAMPLE ID	OP 30D	GP-31A	GP-DUP4	GP 32A	GP 32B	DUPE 01	OP 33A	GP 33B	HA-1A	GPDUP2	HA-2A	HA-3A
LAR ID	N12322-16	N1409-4	N1409-8	N12323-24	N16274-6	N12323-29	N12323-26	N16274-3	N1314-12	N1313-11	N1529-1	N1529-3
DATE	4/11/2002	10/24/2001	10/24/2001	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	10/23/2001	10/23/2001	10/26/2001	10/26/2001
SAMPLE INTERVAL (BGS)	1.5 - 2	0.3-0.8	0.3-0.8	0.5 - 1	1.5 - 2	1.5 - 2	0.5 - 1	1.5 - 2	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE	NJDEP IGW											
Pesticide & PCB	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Dieldrin	0.18	NA		0.0037 U	1		0.0036 U		NA		0.004 U	1
Aroclor 1242	2	17 U	1	0.037 U	1		0.036 U		17 U	1	NA	
Aroclor 1248	2	17 U	1	0.037 U	1		0.036 U		17 U	1	NA	
Aroclor 1254	2	0.327	1	0.43 J	1		0.3	J	0.321	1	NA	
Aroclor 1260	2	17 U	1	0.48 J	1		0.38		17 U	1	NA	
Total Aroclor	2	0.327		0.91			0.321		NA		0	
Metals	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Aluminum	NC	4,020	1	4,040	1		3,540		3,500	1	1,920	
Antimony	340	5.7	1	169	1		34		24.8	1	0.63 J	
Arsenic	20	2.2	1	22.2	1		9.9		5.9	1	0.68 U	
Barium	47,000	37	1	99.8	1		129		88.1	1	11.3 J	
Beryllium	2	0.57 U	1	0.08 J	1		0.15	J	0.47 U	1	0.13 J	
Cadmium	100	0.57 U	1	2.4	1		4.6		1.4	1	0.08 U	
Copper	600	89.6	1	483	1		523		438	1	7.3	
Iron	NC	5530	1	14,900	1		19,600		17,600	1	3750	
Lead	600	594	1	7,860	1		2,440		3,350	1	2.6	
Manganese	NC	72.1	1	82.3	1		208		134	1	13.3	
Mercury	270	0.11	1	1.5	1		0.83		1.3	3	0.03 U	
Nickel	2,400	5.8	1	32.1	1		64.6		13.1	1	1.8 J	
Silver	4,100	1.1 U	1	0.7 J	1		0.15	U	0.94 U	1	0.14 U	
Sodium	NC	370	U	71.1 J	1		21.1	U	470 U	1	95.1 J	
Thallium	2	1.1 U	1	NA			NA		0.94 U	1	0.93 U	
Zinc	1,500	248	1	562	1		1,320		317	1	6.7	
Soil Characteristics	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
pH	NC	NA	1	5.15	1		6.2		NA	1	NA	
Cyanide (mg/kg)	NC	NA		0.44 B	1		0.05		NA		0.05 U	

- Notes:
- * NJDEP IGW = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
 - Shaded values exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.
 - D = Sample diluted.
 - NA = Not Available.

TABLE 5-4
Matteo Iron and Metal
Surface Soil Sample Results (0-2 ft) from the Scrapyard - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION		Surface Soil Sample Results (0-2 ft) From the Scrapyard - Impact to Groundwater Criteria (IGW)																	
SAMPLE ID		HA-4A	HA-5A	HA-6A	HA-7A	HA-8A	HA-8B	HA-9A	HA-10A	HA-10B	HA-11A	HA-12A	HA-12B	HA-13A					
LAB ID		N12323-1	N12323-3	N12323-5	N12323-7	N12323-9	N16274-9	N12323-11	N12323-13	N16274-7	N12323-15	N12323-17	N16274-7	N12323-19					
DATE		4/11/2002	4/11/2002	4/11/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002	4/11/2002	6/14/2002	4/11/2002					
SAMPLE INTERVAL (BGS)		0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5					
ANALYTE	NJDEP IGW																		
Pesticide & PCB		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Dieldrin	0.18	NA			NA			NA			NA			NA			NA		
Aroclor 1242	2	0.017 U	I		0.017 U	I		0.017 U			0.039 U	I		0.017 U	I		0.02 U	I	
Aroclor 1248	2	0.017 U	I		0.017 U	I		0.017 U			0.039 U	I		0.017 U	I		0.02 U	I	
Aroclor 1254	2	0.086 I			0.16 I			0.252			0.018 U	I		0.018 U	I		0.11 I		
Aroclor 1260	2	0.039 I			0.070 I			0.017 U			0.018 U	I		2 S			0.21 J	I	
Total Aroclor	2	0.125			0.230 I			0.252			0			2			0.32		
											0.071			6.74			0.58 J		
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Aluminum	NC	NA			NA			NA			NA			NA			NA		
Antimony	340	NA			NA			NA			NA			NA			NA		
Arsenic	20	NA			NA			NA			NA			NA			NA		
Barium	47,000	NA			NA			NA			NA			NA			NA		
Beryllium	2	NA			NA			NA			NA			NA			NA		
Cadmium	100	NA			NA			NA			NA			NA			NA		
Copper	600	NA			NA			NA			NA			NA			NA		
Iron	NC	NA			NA			NA			NA			NA			NA		
Lead	600	NA			NA			NA			NA			NA			NA		
Manganese	NC	NA			NA			NA			NA			NA			NA		
Mercury	270	NA			NA			NA			NA			NA			NA		
Nickel	2,400	NA			NA			NA			NA			NA			NA		
Silver	4,100	NA			NA			NA			NA			NA			NA		
Sodium	NC	NA			NA			NA			NA			NA			NA		
Thallium	2	NA			NA			NA			NA			NA			NA		
Zinc	1,500	NA			NA			NA			NA			NA			NA		
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
pH	NC	NA	I		NA	I		NA	I		8.68			NA	I		6.78		
Cyanide (mg/kg)	NC	NA			NA			NA			NA			NA			5.26 I		

- Notes:
- * NJDEP IGW = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not exceed soil cleanup criteria in any sample.
 - Shaded values exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - I = Estimated value, below the CRQL.
 - D = Sample diluted.
 - NA = Not Available.

TABLE 5-5
Matteo Iron and Metal

Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Residential Criteria (RSCC)																				
SAMPLE ID		GP-7	GP-11	GP-12	GP-12	GP-12	GP-13	GP-14	GP-14	GP-15	GP-16	GP-17	GP-18	GP-19								
LAB ID		GP-7D	GP-11B	GP-12E	DUP	GP-12B	GP-13B	GP-14E	GP-14B	GP-15B	GP-16B	GP-17B	GP-18B	GP-19B								
DATE		N16274-4	N1314-1	N16274-2	N16274-10	N1314-3	N1314-6	N16274-1	N1314-9	N1315-1	N1315-4	N1315-7	N1315-10	N1313-2								
SAMPLE INTERVAL (BGS)		6/14/2002	10/23/2001	6/14/2002	10/23/2001	10/23/2001	10/23/2001	6/14/2002	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001								
SAMPLE INTERVAL (BGS)		2.5-3	3.5-4	2.5-3	2.5-3	3.5-4	3.5-4	2.5-3	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4								
ANALYTE	NJDEP																					
Pesticide & PCB	Residential	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D			
Dieldrin	0.042	NA			0.0037	U	1	NA			0.0038	U	0.0037	U	1	NA						
Aroclor 1242	0.49	NA			0.037	U	1	0.036	U	1	0.036	U	1	0.038	U	0.037	U	1	0.035	U	1	
Aroclor 1248	0.49	NA			0.037	U	1	0.036	U	1	0.036	U	1	0.038	U	0.037	U	1	0.035	U	1	
Aroclor 1254	0.49	NA			0.037	U	1	0.036	U	1	0.036	U	1	0.038	U	0.037	U	1	0.035	U	1	
Aroclor 1260	0.49	NA			0.037	U	1	0.17			0.036	U	1	0.038	U	0.037	U	1	0.041			
Total Aroclor	0.49	NA			0			0.17			0			0		0.041			0.057			
Metals Analysis		Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D</td></td></td>	D <td>Result</td> <td>Q<td>D</td></td>	Result	Q <td>D</td>	D
Aluminum	NC	1,980			1	NA		2,850			1	2,500		1	NA		2,420			1	NA	
Antimony	14	0.98			J	1	NA	0.94			J	1	0.92			J	1	NA			0.92	
Arsenic	20	1.4			J	1	NA	2			J	1	1.7			J	1	NA			2.3	
Barium	700	10			J	1	NA	13.4			J	1	13.7			J	1	NA			19.9	
Beryllium	2	0.11			J	1	NA	0.13			J	1	0.13			J	1	NA			0.14	
Cadmium	39	0.09			U	1	NA	0.09			U	1	0.08			U	1	NA			0.23	
Copper	600	2			J	1	NA	2.4			J	1	2.1			J	1	NA			1.9	
Iron	NC	4,100			1	NA		5,890			1	5,020		1	NA		4,970			1	NA	
Lead	400	1.7			J	1	NA	2.5			J	1	2.5			J	1	NA			2.3	
Manganese	NC	22.4			1	NA		24.5			1	23.9		1	NA		19.2			1	NA	
Mercury	14	0.04			U	1	NA	0.03			U	1	0.03			U	1	NA			0.04	
Nickel	250	2.5			J	1	NA	3.1			J	1	3.2			J	1	NA			2.6	
Silver	110	0.15			U	1	NA	0.15			U	1	0.15			U	1	NA			0.15	
Sodium	NC	103			J	1	NA	82			J	1	81.7			J	1	NA			105	
Thallium	2	0.97			U	1	NA	0.97			U	1	0.91			U	1	NA			0.95	
Zinc	1500	9.9			J	1	NA	14.6			J	1	12.7			J	1	NA			22.9	
General Chemistry		Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td></td>	D <td>Result</td> <td>Q<td>D<td>Result</td><td>Q<td>D</td></td></td></td>	Result	Q <td>D<td>Result</td><td>Q<td>D</td></td></td>	D <td>Result</td> <td>Q<td>D</td></td>	Result	Q <td>D</td>	D
pH	NC	NA			7.83			7.32			7.32		7.32			7.85		7.38			7.26	
Cyanide (mg/kg)	NC	0.05			U	1	NA	0.05			U	1	0.05			U	1	NA			0.08	
Notes:																						

Notes:

- NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- D = Dilution Factor
- Q = Qualifier
- U = Non Detect
- J = Estimated
- NA = Not Available

TABLE 5-5
Matteo Iron and Metal

Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-20	GP-21	GP-22	GP-23	GP-24	GP-25	GP-26	GP-27	GP-28	GP-29
SAMPLE ID		GP-20B	GP-21B	GP-22B	GP-23B	GP-24B	GP-25B	GP-26B	GP-27B	GP-28B	GP-29B
LAB ID		N1313-5	N1313-8	N1314-15	N1405-2	N1405-5	N1405-8	N1405-11	N1405-14	N1405-16	N1405-19
DATE		10/23/2001	10/23/2001	10/23/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001
SAMPLE INTERVAL (BGS)		3.5-4	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4
ANALYTE		NJDEP		Result		Result		Result		Result	
Pesticide & PCB		Residential		Result		Result		Result		Result	
Dieldrin		0.042		0.0034 U 1		0.0036 U		0.0039 U		0.0041 U 1	
Aroclor 1242		0.49		0.034 U 1		0.036 U		0.039 U		0.041 U 1	
Aroclor 1248		0.49		0.034 U 1		0.036 U		0.039 U		0.041 U 1	
Aroclor 1254		0.49		0.034 U 1		0.036 U		0.039 U		0.041 U 1	
Aroclor 1260		0.49		0.034 U 1		0.036 U		0.039 U		0.041 U 1	
Total Aroclor		0.49		0		0		0		0	
Metals Analysis		Result		Result		Result		Result		Result	
Aluminum		NC		NA		3,580		5,290		3,620	
Antimony		14		NA		0.53		J 17.5		0.44 U 1	
Arsenic		20		NA		3.8		11.2		2.2	
Barium		700		NA		12.6		J 871		1.5	
Beryllium		2		NA		0.16		J 0.24		0.11	
Cadmium		39		NA		0.06		U 18.2		0.06 U 1	
Copper		600		NA		3		J 574		4.1	
Iron		NC		NA		7,830		41,500		6,440	
Lead		400		NA		3.1		4,240		6	
Manganese		NC		NA		37		472		1	
Mercury		14		NA		0.04		J 2.2		0.03 U 1	
Nickel		250		NA		4.3		J 94.7		4.4	
Silver		110		NA		0.15		U 0.75		0.15 U 1	
Sodium		NC		NA		20.3		U 45.2		34	
Thallium		2		NA		NA		NA		29.4	
Zinc		1500		NA		11.8		17,400		18	
General Chemistry		Result		Result		Result		Result		Result	
pH		NC		6.72		1		6.84		6.25	
Cyanide (mg/kg)		NC		NA		0.05		U 0.24		0.05	

Notes:
 - * NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 D = Dilution Factor
 Q = Qualifier
 U = Non Detect
 J = Estimated
 NA = Not Available

TABLE 5-5
Matteo Iron and Metal

Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-30			GP-31			HA-1			HA-2			HA-3		
SAMPLE ID		GP 30E			GP-31B			HA-1B			HA-2B			HA-3B		
LAB ID		N16274-5			N1409-2			N1314-13			N1529-2			N1529-4		
DATE		6/14/2002			10/24/2001			10/23/2001			10/26/2001			10/26/2001		
SAMPLE INTERVAL (BGS)		2.5 - 3			3.5-4			3.5-4			3.5-4			3.5-4		
ANALYTE		NJDEP														
Pesticide & PCB		Residential														
		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Dieldrin		0.042	NA		0.0035	U	1	0.0036	U	1	0.0034	U	1	0.0034	U	1
Aroclor 1242		0.49	NA		0.035	U	1	0.036	U	1	0.034	U	1	0.034	U	1
Aroclor 1248		0.49	NA		0.035	U	1	0.036	U	1	0.034	U	1	0.034	U	1
Aroclor 1254		0.49	NA		0.035	U	1	0.036	U	1	0.034	U	1	0.034	U	1
Aroclor 1260		0.49	NA		0.035	U	1	0.036	U	1	0.034	U	1	0.034	U	1
Total Aroclor		0.49	NA		0			0			0			0		
Metals Analysis		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Aluminum		NC	2980		2,470		1	2,790		1	NA		5,270		1	3,310
Antimony		14	0.64	J	1	2.2	J	1	0.66	J	1	NA		0.52	U	1
Arsenic		20	2.1		2.1	J	1	1.6	J	1	NA		3.3		1.5	J
Barium		700	12.5	J	1	14.7	J	1	11.7	J	1	NA		18.6	J	1
Beryllium		2	0.17	J	1	0.09	J	1	0.14	J	1	NA		0.25	J	1
Cadmium		39	0.32	J	1	0.16	J	1	1.1	J	1	NA		0.18	J	1
Copper		600	17.6		10.8		1	2.5	J	1	NA		5.4		6.5	
Iron		NC	6130		5,440		1	5,100		1	NA		10,700		6,370	
Lead		400	2.7		9.6		1	3.3		1	NA		4.7		10.9	
Manganese		NC	28.2		24.1		1	25.7		1	NA		80.5		35	
Mercury		14	0.04	U	1	2.1	U	1	0.03	U	1	NA		0.04	U	1
Nickel		250	4.1	J	1	2.9	J	1	3.7	J	1	NA		6.4	J	1
Silver		110	0.15	U	1	0.15	U	1	0.15	U	1	NA		0.17	U	1
Sodium		NC	62.8	J	1	78.5	J	1	84.7	J	1	NA		105	J	1
Thallium		2	0.9	U	1	NA			NA			NA		NA		
Zinc		1500	74.6		125		1	50.6		1	NA		16.6		18.4	
General Chemistry		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
pH		NC	NA		6.8		1	7.03		1	6.95		1	5.46		6.43
Cyanide (mg/kg)		NC	0.05	U	1	0.05	U	1	0.05	U	1	NA		0.05	U	1

Notes:

- * NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- D = Dilution Factor
- Q = Qualifier
- U = Non Detect
- J = Estimated
- NA = Not Available

TABLE 5-6
Matteo Iron and Metal

Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-7		GP-11		GP-12		GP-12		GP-12		GP-13		GP-14		GP-14		GP-15		GP-16		GP-17		GP-18		GP-19									
SAMPLE ID		GP-7D		GP-11B		GP-12E		DUP		GP-12B		GP-13B		GP-14E		GP-14B		GP-15B		GP-16B		GP-17B		GP-18B		GP-19B									
LAB ID		N16274-4		N1314-1		N16274-2		N16274-10		N1314-3		N1314-6		N16274-1		N1314-9		N1315-1		N1315-4		N1315-7		N1315-10		N1313-2									
DATE		6/14/2002		10/23/2001		6/14/2002		6/14/2002		10/23/2001		10/23/2001		6/14/2002		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001									
SAMPLE INTERVAL (BGS)		2.5-3		3.5-4		2.5-3		2.5-3		3.5-4		3.5-4		2.5-3		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4									
ANALYTE		NJDEP Non-Residential		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D			
Pesticide & PCB		0.18		NA		0.0037		U		1		NA		NA		0.0038		U		1		0.0036		U		1		0.0034		U		1			
Dieldrin		2		NA		0.037		U		1		0.036		U		1		0.036		U		1		0.038		U		1		0.035		U		1	
Aroclor 1242		2		NA		0.037		U		1		0.036		U		1		0.036		U		1		0.036		U		1		0.034		U		1	
Aroclor 1248		2		NA		0.037		U		1		0.036		U		1		0.036		U		1		0.036		U		1		0.034		U		1	
Aroclor 1254		2		NA		0.037		U		1		0.036		U		1		0.036		U		1		0.036		U		1		0.034		U		1	
Aroclor 1260		2		NA		0.037		U		1		0.17		1		0.036		U		1		0.038		U		1		0.041		1		0.057		1	
Total Aroclor		2		NA		0						0.17		0		0						0.041		0.057		0				0		0.0683			
Metals Analysis				Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D			
Aluminum		NC		1,980		1		NA				2,850		1		2,500		1		NA		NA		NA		2,420		1		NA		NA			
Antimony		3-10		0.98		J		1		NA		0.94		J		1		0.92		J		1		NA		NA		0.92		J		1			
Arsenic		20		1.4		J		1		NA		2		J		1		1.7		J		1		NA		NA		2.3		J		1			
Barium		47,000		10		J		1		NA		13.4		J		1		13.7		J		1		NA		NA		19.9		J		1			
Beryllium		2		0.11		J		1		NA		0.13		J		1		0.13		J		1		NA		NA		0.14		J		1			
Cadmium		100		0.09		U		1		NA		0.09		U		1		0.08		U		1		NA		NA		0.23		J		1			
Copper		600		2		J		1		NA		2.4		J		1		2.1		J		1		NA		NA		1.9		J		1			
Iron		NC		4,100		1		NA				5,890		1		5,020		1		NA		NA		NA		4,970		1		NA		NA			
Lead		600		1.7		J		1		NA		2.5		J		1		2.5		J		1		NA		NA		2.3		J		1			
Manganese		NC		22.4		1		NA				24.5		1		23.9		1		NA		NA		NA		19.2		1		NA		NA			
Mercury		270		0.04		U		1		NA		0.03		U		1		0.03		U		1		NA		NA		0.04		U		1			
Nickel		2,400		2.5		J		1		NA		3.1		J		1		3.2		J		1		NA		NA		2.6		J		1			
Silver		110		0.15		U		1		NA		0.15		U		1		0.15		U		1		NA		NA		0.15		U		1			
Sodium		4,100		103		J		1		NA		82		J		1		81.7		J		1		NA		NA		105		J		1			
Thallium		2		0.97		U		1		NA		0.97		U		1		0.91		U		1		NA		NA		0.95		U		1			
Zinc		1,500		9.9		J		1		NA		14.6		J		1		12.7		J		1		NA		NA		22.9		J		1			
General Chemistry				Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D			
pH		NC		NA						7.83		1		7.32		1		7.32		1		7.85		7.38		1		7.26		1		4.92		1	
Cyanide (mg/kg)		NC		0.05		U		1		NA		0.05		U		1		0.05		U		1		NA		NA		0.08		J		1			

Notes:
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 - Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 D = Dilution Factor
 Q = Qualifier
 U = Non Detect
 J = Estimated
 NA = Not Available

TABLE 5-6
Matteo Iron and Metal

Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)																			
SAMPLE ID		GP-20		GP-21		GP-22		GP-23		GP-24		GP-25		GP-26		GP-27		GP-28		GP-29	
LAB ID		GP-20B		GP-21B		GP-22B		GP-23B		GP-24B		GP-25B		GP-26B		GP-27B		GP-28B		GP-29B	
DATE		N1313-5		N1313-8		N1314-15		N1405-2		N1405-5		N1405-8		N1405-11		N1405-14		N1405-16		N1405-19	
SAMPLE INTERVAL (BGS)		10/23/2001		10/23/2001		10/23/2001		10/24/2001		10/24/2001		10/24/2001		10/24/2001		10/24/2001		10/24/2001		10/24/2001	
ANALYTE		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4		3.5-4	
NJDEP Non-Residential																					
		Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D
Pesticide & PCB																					
Dieldrin	0.18	0.0034	U I	0.0036	U	0.0039	U	0.0041	U I	0.0034	U I	0.0037	U	0.0035	U I	0.0037	Q U	0.0035	Q U	0.004	Q U
Aroclor 1242	2	0.034	U I	0.036	U	0.039	U	0.041	U I	0.034	U I	0.037	U	0.035	U I	0.037	U I	0.035	U I	0.04	U I
Aroclor 1248	2	0.034	U I	0.036	U	0.039	U	0.041	U I	0.034	U I	0.037	U	0.035	U I	0.037	U I	0.035	U I	0.04	U I
Aroclor 1254	2	0.034	U I	0.036	U	0.039	U	0.041	U I	0.034	U I	0.037	U	0.035	U I	0.037	U I	0.035	U I	0.04	U I
Aroclor 1260	2	0.034	U I	0.036	U	0.039	U	0.041	U I	0.034	U I	0.037	U	0.035	U I	0.037	U I	0.035	U I	0.04	U I
Total Aroclor	2	0		0		0		0		0		0		0		0		0		0	
Metals Analysis																					
Aluminum	NC	NA		NA		3,580		5,290		3,620		3,440		3,560		2,190		7,430		8,800	
Antimony	340	NA		NA		0.53	J	17.5		0.44	U I	0.45	U	0.44	U I	0.45	U I	0.45	U I	0.46	U I
Arsenic	20	NA		NA		3.8		11.2		2.2		1.5	J	4.3		0.5	U I	12.3		5.5	
Barium	47,000	NA		NA		12.6	J	871		21.8	J	17.8	J	10.2	J	10.2	J	17.2	J	29.2	J
Beryllium	2	NA		NA		0.16	J	0.24	J	0.11	J	0.1	J	0.14	J	0.06	J	0.34	J	0.27	J
Cadmium	100	NA		NA		0.06	U	18.2		0.06	U I	0.26	J	0.06	U I	0.06	U I	0.06	U I	0.07	U I
Copper	600	NA		NA		3	J	574		4.1	J	2.8	J	2.3	J	1.4	J	5.9		5.5	
Iron	NC	NA		NA		7,830		41,500		6,440		3,600		4,460		1,810		16,700		15,300	
Lead	600	NA		NA		3.1		4,240		6		5.5		2.9		3		5		10.6	
Manganese	NC	NA		NA		37		472		37		29		35.7		9.9		65.5		68.9	
Mercury	270	NA		NA		0.04	J	2.2	2	0.03	U I	0.04	U	0.03	U I	0.03	U I	0.03	U I	0.03	U I
Nickel	2,400	NA		NA		4.3	J	94.7		4.4	J	9.1		2.8	J	1.9	J	7.2	J	7.3	J
Silver	110	NA		NA		0.15	U	0.75	J	0.15	U I	0.15	U	0.15	U I	0.15	U I	0.15	U I	0.18	B
Sodium	4,100	NA		NA		20.3	U	45.2	U	34	J	29.4	J	30.7	J	40.6	J	20.8	U I	21.2	U I
Thallium	2	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	1,500	NA		NA		11.8		17,400		18		292		31.8		7.3		21.4		22.7	
General Chemistry																					
pH	NC	6.72	I	6.84		6.25		7.9		7.7		5.81		4.08		5.5		5.57		5.57	
Cyanide (mg/kg)	NC	NA		NA		0.05	U	0.24	J	0.05	U I	0.05	U	0.05	U I	0.05	U I	0.05	U I	0.06	U I
Notes:																					

Notes:

- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.

- All results in mg/kg.

D = Dilution Factor

Q = Qualifier

U = Non Detect

J = Estimated

NA = Not Available

TABLE 5-6
Matteo Iron and Metal

Intermediate Soil Sample Results (2-4 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-30	GP-30	GP-31	HA-1	HA-2	HA-3
SAMPLE ID		GP 30E	GP-30B	GP-31B	HA-1B	HA-2B	HA-3B
LAB ID		N16274-5	N1409-2	N1409-5	N1314-13	N1529-2	N1529-4
DATE		6/14/2002	10/24/2001	10/24/2001	10/23/2001	10/26/2001	10/26/2001
SAMPLE INTERVAL (BGS)		2.5 - 3	3.5-4	3.5-4	3.5-4	3.5-4	3.5-4
ANALYTE	NJDEP Non-Residential	Result	Q D	Result	Q D	Result	Q D
Pesticide & PCB							
Dieldrin	0.18	NA		0.0035	U 1	0.0036	U 1
Aroclor 1242	2	NA		0.035	U 1	0.036	U 1
Aroclor 1248	2	NA		0.035	U 1	0.036	U 1
Aroclor 1254	2	NA		0.035	U 1	0.036	U 1
Aroclor 1260	2	NA		0.035	U 1	0.036	U 1
Total Aroclor	2	NA		0		0	
Metals Analysis							
Aluminum	NC	2980	1	2,470	1	2,790	1
Antimony	340	0.64	J 1	2.2	J 1	0.66	J 1
Arsenic	20	2.1	J 1	2.1	J 1	1.6	J 1
Barium	47,000	12.5	J 1	14.7	J 1	11.7	J 1
Beryllium	2	0.17	J 1	0.09	J 1	0.14	J 1
Cadmium	100	0.32	J 1	0.16	J 1	1.1	J 1
Copper	600	17.6	1	10.8	1	2.5	J 1
Iron	NC	6130	1	5,440	1	5,100	1
Lead	600	2.7	1	9.6	1	3.3	1
Manganese	NC	28.2	1	24.1	1	25.7	1
Mercury	270	0.04	U 1	2.1	U 1	0.03	U 1
Nickel	2,400	4.1	J 1	2.9	J 1	3.7	J 1
Silver	110	0.15	U 1	0.15	U 1	0.15	U 1
Sodium	4,100	62.8	J 1	78.5	J 1	84.7	J 1
Thallium	2	0.9	U 1	NA		NA	
Zinc	1,500	74.6	1	125	1	50.6	1
General Chemistry							
pH	NC	NA		6.8	1	7.03	1
Cyanide (mg/kg)	NC	0.05	U 1	0.05	U 1	0.05	U 1

Notes:

- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- D = Dilution Factor.
- Q = Qualifier
- U = Non Detect
- J = Estimated
- NA = Not Available

TABLE 5-7
Matteo Iron and Metal

Deep Soil Sample Results (~10-12 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-01	GP-02	GP-03	GP-04	GP-05	GP-06	GP-07	GP-08	GP-09	GP-10	GP-10	
SAMPLE ID		GP-01B	GP-02B	GP-03B	GP-04B	GP-05B	GP-06B	GP-07B	GP-08B	GP-09B	GP-10B	GP-11B	
LAB ID		E70304-13	E76579-4	E72118-9	E76579-8	E76579-9	E76579-12	E76579-14	E76579-16	E76579-18	E76579-20	E76579-21	
DATE		9/11/2000	9/11/2000	6/28/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	
SAMPLE INTERVAL (BGS)		11-11.5	11-11.5	11-11.5	11-11.5	11-11.5	11-11.5	11-11.5	10.5-11	10.5-11	10-11	10-11	
ANALYTE													
NJDEP Residential		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds													
Benzene	3	0.011 U		0.011 U		0.01 U		0.003 J		0.011 U		0.0005 J	
Cis-1,2-Dichloroethene	79	0.011 U		0.011 U		0.01 U		0.01 U		0.011 U		0.01 U	
Ethylbenzene	1,000	0.011 U		0.011 U		0.01 U		0.01 U		0.011 U		0.01 U	
Vinyl chloride	2	0.011 U		0.011 U		0.01 U		0.01 U		0.011 U		0.01 U	
Xylene (total)	410	0.011 U		0.011 U		0.01 U		0.004 J		0.011 U		0.005	
Semi-Volatile Organic Compounds													
Benzo(a)anthracene	0.9	0.33 U		0.075 J		0.37 U		0.08 J		0.34 U		0.22 J	
Benzo(a)pyrene	0.66	0.33 U		0.091 J		0.37 U		0.069 J		0.34 U		0.17 J	
Benzo(b)fluoranthene	0.9	0.33 U		0.097 J		0.37 U		0.089 J		0.34 U		0.14 J	
Benzo(k)fluoranthene	0.9	0.33 U		0.064 J		0.37 U		0.045 J		0.34 U		0.14 J	
bis(2-Ethylhexyl)phthalate	49	0.95		0.51		0.33 J		1.7		0.26 J		1	
Dibenz(a,h)anthracene	0.66	0.33 U		0.36 U		0.37 U		0.34 U		0.34 U		0.036 J	
Indeno(1,2,3-cd)pyrene	0.9	0.33 U		0.057 J		0.37 U		0.041 J		0.34 U		0.078 J	
Pesticide & PCB													
Dieldrin	0.042	0.0034 U		0.017 U		0.0035 U		0.019 U		0.0041 U		0.0035 U	
Aroclor 1242	0.49	0.034 U		0.037 U		0.034 U		0.034 U		0.035 U		0.036 U	
Aroclor 1248	0.49	0.034 U		0.037 U		0.034 U		0.034 U		0.035 U		0.036 U	
Aroclor 1254	0.49	0.064		3.5 J		0.034 U		0.6		0.035 U		0.12	
Aroclor 1260	0.49	0.034 U		1 J		0.034 U		0.2		0.035 U		0.036 U	
Total Aroclor	0.49	0.064		4.5		0.034 U		0.8		0.035 U		0.12	
Metals													
Aluminum	NC	2,680		3,620		3,260		3,330		3,280		1,260	
Antimony	14	0.35		14.9		0.79 J		16.4		1.7 J		17.3	
Arsenic	20	0.95 J		4.1		1.7 J		4		3.3		4.4	
Barium	700	7.6 J		50.3		13.9 J		42.9		21.1 J		14.5 J	
Beryllium	2	0.07 J		0.15 J		0.08 J		0.12 J		0.1 J		0.04 U	
Cadmium	39	0.09 J		1.5		0.19 J		2		0.43 J		0.07 U	
Copper	600	4 J		1,400		12.1		112		225		37.4	
Iron	NC	5,360		15,200		6,590		11,400		6,730		5,200	
Lead	400	4.8		468		53		1,560		124		2,170	
Manganese	NC	38.2		232		44.7		212		37.1		14.5	
Mercury	14	0.05 J		0.47		0.09		0.64		0.48		0.07 J	
Nickel	250	3.9 J		23.8		5 J		12		11.7		1.8 J	
Silver	110	0.15 U		0.38 J		0.25 J		0.35 J		0.16 J		0.15 U	
Sodium	NC	17.9 U		76.3 J		18.1 U		74.6 J		19.1 J		59.4 J	
Thallium	2	0.75 U		0.77 U		0.76 U		0.75 U		0.76 U		0.79 U	
Zinc	1,500	16.8		246		39.5		230		163		22.4	
Soil Characteristics													
pH	NC	8.2		7.8		7.4		7.8		7		5.7	
Cyanide (mg/kg)	NC	NA		NA		NA		NA		NA		NA	
Notes:													

Notes:

- * NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.

- U = Not detected above the Contact Required Quantitation Limit
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-7
Matteo Iron and Metal

Deep Soil Sample Results (~10-12 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-12		GP-13		GP-14		GP-15		GP-16		GP-17		GP-18		GP-19		GP-20		GP-21						
SAMPLE ID		GP-12C		GP-13C		GP-14C		GP-15C		GP-16C		GP-17C		GP-18C		GP-19C		GP-20C		GP-21C						
LAB ID		N1314-4		N1314-7		N1314-10		N1315-2		N1315-5		N1315-8		N1315-11		N1313-3		N1313-6		N1313-9						
DATE		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001		10/23/2001						
SAMPLE INTERVAL (BGS)		11.5-12		11.5-12		11.5-12		11-11.5		11.5-12		12-12.5		11.5-12		11.1-11.6		11-11.5		11.5-12						
ANALYTE		NJDEP																								
Residential		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		
Volatile Organic Compounds																										
Benzene	3	NA			NA				NA				NA			NA			NA				NA			
cis-1,2-Dichloroethene	79	NA			NA				NA				NA			NA			NA				NA			
Ethylbenzene	1,000	NA			NA				NA				NA			NA			NA				NA			
Vinyl chloride	2	NA			NA				NA				NA			NA			NA				NA			
Xylene (total)	410	NA			NA				NA				NA			NA			NA				NA			
Semi-Volatile Organic Compounds		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		
Benzo(a)anthracene	0.9	NA			NA				NA				NA			NA			NA				NA			
Benzo(a)pyrene	0.66	NA			NA				NA				NA			NA			NA				NA			
Benzo(b)fluoranthene	0.9	NA			NA				NA				NA			NA			NA				NA			
Benzo(k)fluoranthene	0.9	NA			NA				NA				NA			NA			NA				NA			
bis(2-Ethylhexyl)phthalate	49	NA			NA				NA				NA			NA			NA				NA			
Dibenz(a,h)anthracene	0.66	NA			NA				NA				NA			NA			NA				NA			
Indeno(1,2,3-cd)pyrene	0.9	NA			NA				NA				NA			NA			NA				NA			
Pesticide & PCB		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		
Dieldrin	0.042	0.004	U	1	0.0037	U	1		0.0038	U	1		0.0035	U		0.0036	U	1		0.0037	U	1		0.0036	U	1
Aroclor 1242	0.49	0.04	U	1	0.037	U	1		0.038	U	1		0.035	U		0.036	U	1		0.037	U	1		0.037	U	1
Aroclor 1248	0.49	0.04	U	1	0.037	U	1		0.038	U	1		0.035	U		0.036	U	1		0.037	U	1		0.037	U	1
Aroclor 1254	0.49	0.04	U	1	0.037	U	1		0.038	U	1		0.035	U		0.036	U	1		0.037	U	1		0.037	U	1
Aroclor 1260	0.49	0.04	U	1	0.037	U	1		0.038	U	1		0.035	U		0.036	U	1		0.037	U	1		0.037	U	1
Total Aroclor	0.49	0			0				0				0			0			0				0			
Metals		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		
Aluminum	NC	NA			NA				NA				NA			NA			NA				NA			
Antimony	14	NA			NA				NA				NA			NA			NA				NA			
Arsenic	20	NA			NA				NA				NA			NA			NA				NA			
Barium	700	NA			NA				NA				NA			NA			NA				NA			
Beryllium	2	NA			NA				NA				NA			NA			NA				NA			
Cadmium	39	NA			NA				NA				NA			NA			NA				NA			
Copper	600	NA			NA				NA				NA			NA			NA				NA			
Iron	NC	NA			NA				NA				NA			NA			NA				NA			
Lead	400	NA			NA				NA				NA			NA			NA				NA			
Manganese	NC	NA			NA				NA				NA			NA			NA				NA			
Mercury	14	NA			NA				NA				NA			NA			NA				NA			
Nickel	250	NA			NA				NA				NA			NA			NA				NA			
Silver	110	NA			NA				NA				NA			NA			NA				NA			
Sodium	NC	NA			NA				NA				NA			NA			NA				NA			
Thallium	2	NA			NA				NA				NA			NA			NA				NA			
Zinc	1,500	NA			NA				NA				NA			NA			NA				NA			
Soil Characteristics		Result		Q		D		Result		Q		D		Result		Q		D		Result		Q		D		
pH	NC	7.23	1		8.14	1		4.93	1		7.18	1		5.69	1		5.19	1		5.35	1		6.92	1		
Cyanide (mg/kg)	NC	NA			NA				NA				NA			NA			NA				NA			

Notes:

- NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.

- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-7
Matteo Iron and Metal
Deep Soil Sample Results (~10-12 ft) from the Scrapyard - Residential Criteria (RSCC)

SAMPLE LOCATION		GP-22	GP-23	GP-24	GP-25	GP-26	GP-28	GP-29	GP-30	GP-31	GP-34		
SAMPLE ID		GP-22C	GP-23C	GP-24C	GP-25C	GP-26C	GP-28C	GP-29C	GP-30C	GP-31C	GP-34		
LAB ID		N1314-16	N1405-3	N1405-6	N1405-9	N1405-12	N1405-17	N1405-20	N1409-3	N1409-6	N12323-28		
DATE		10/23/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	4/11/2002		
SAMPLE INTERVAL (BGS)		11-11.5	12-12.5	9.5-10	5-5.5	10-10.5	7.5-8	5.5-6	11.5-12	11.5-12	11-11.5		
ANALYTE	NJDEP	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Residential		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Volatile Organic Compounds													
Benzene	3	NA			NA			NA			NA		
cis-1,2-Dichloroethene	79	NA			NA			NA			NA		
Ethylbenzene	1,000	NA			NA			NA			NA		
Vinyl chloride	2	NA			NA			NA			NA		
Xylene (total)	410	NA			NA			NA			NA		
Semi-Volatile Organic Compounds													
Benzo(a)anthracene	0.9	NA			NA			NA			NA		
Benzo(a)pyrene	0.66	NA			NA			NA			NA		
Benzo(b)fluoranthene	0.9	NA			NA			NA			NA		
Benzo(k)fluoranthene	0.9	NA			NA			NA			NA		
bis(2-Ethylhexyl)phthalate	49	NA			NA			NA			NA		
Dibenz(a,h)anthracene	0.66	NA			NA			NA			NA		
Indeno(1,2,3-cd)pyrene	0.9	NA			NA			NA			NA		
Pesticide & PCB													
Dieldrin	0.042	0.0035 U	1		0.0039 U	1		0.0038 U	1		0.0041 U	1	
Aroclor 1242	0.49	0.035 U	1		0.039 U	1		0.038 U	1		0.041 U	1	
Aroclor 1248	0.49	0.035 U	1		0.039 U	1		0.038 U	1		0.041 U	1	
Aroclor 1254	0.49	0.035 U	1		0.039 U	1		0.038 U	1		0.041 U	1	
Aroclor 1260	0.49	0.035 U	1		0.039 U	1		0.038 U	1		0.041 U	1	
Total Aroclor	0.49	0			0			0			0		
Metals													
Aluminum	NC	2,510	1		2,400	1		4,000	1		5,820	1	
Antimony	14	0.45 U	1		0.46 U	1		0.45 U	1		0.47 U	1	
Arsenic	20	0.5 U	1		0.84 J	1		1.8 J	1		1.7 J	1	
Barium	700	7.1 J	1		5.5 J	1		10.5 J	1		11.2 J	1	
Beryllium	2	0.08 J	1		0.03 J	1		0.18 J	1		0.11 J	1	
Cadmium	39	0.06 U	1		0.07 U	1		0.06 U	1		0.07 U	1	
Copper	600	2.4 J	1		3.1 J	1		4.3 J	1		3.7 J	1	
Iron	NC	3580	1		2420	1		5,920	1		7,240	1	
Lead	400	2.2	1		3.4	1		4	1		6.5	1	
Manganese	NC	39.4	1		10.2	1		41.2	1		31.6	1	
Mercury	14	0.03 J	1		0.04 U	1		0.03 U	1		0.03 U	1	
Nickel	250	3.7 J	1		2.1 J	1		5.2 J	1		5.4 J	1	
Silver	110	0.15 U	1		0.15 U	1		0.15 U	1		0.16 U	1	
Sodium	NC	20.8 U	1		60.2 J	1		51.6 B	1		46 J	1	
Thallium	2	NA			NA			NA			NA		
Zinc	1,500	11.1	1		28.1	1		19.3	1		85.7	1	
Soil Characteristics													
pH	NC	6.21	1		7.72	1		7.34	1		7.17	1	
Cyanide (mg/kg)	NC	0.05 U	1		0.06 UN	1		0.05 UN	1		0.06 UN	1	
Notes:													

Notes:

- NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- Bold values indicate concentrations above MDL.
- All results in mg/kg.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.

TABLE 5-8
Matteo Iron and Metal

Deep Soil Sample Results (~10-12 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-01	GP-02	GP-03	GP-04	GP-05	GP-06	GP-07	GP-08	GP-09	GP-10	GP-10	
SAMPLE ID		GP-01B	GP-02B	GP-03B	GP-04B	GP-05B	GP-06B	GP-07B	GP-08B	GP-09B	GP-10B	GP-11B	
LAB ID		E70304-13	E76579-4	E72118-9	E76579-8	E76579-9	E76579-12	E76579-14	E76579-16	E76579-18	E76579-20	E76579-21	
DATE		9/11/2000	9/11/2000	6/28/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	9/11/2000	
SAMPLE INTERVAL (BGS)		11-11.5	11-11.5	11-11.5	11-11.5	11-11.5	11-11.5	11-11.5	10.5-11	10.5-11	10-11	10-11	
ANALYTE	NJDEP Non-Residential	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds													
Benzene	13	0.011 U		0.011 U		0.01 U		0.003 J		0.011 U		0.0005 J	
		0.01 U		0.011 U		0.01 U		0.011 U		0.01 U		0.011 U	
cis-1,2-Dichloroethene	1,000	0.011 U		0.011 U		0.01 U		0.011 U		0.061		0.01 U	
		0.011 U		0.011 U		0.01 U		0.011 U		0.011 U		0.01 U	
Ethylbenzene	1,000	0.011 U		0.011 U		0.01 U		0.011 U		0.011		0.01 U	
		0.011 U		0.011 U		0.01 U		0.011 U		0.01 U		0.011 U	
Vinyl chloride	7	0.011 U		0.011 U		0.01 U		0.011 U		0.011		0.01 U	
		0.011 U		0.011 U		0.01 U		0.011 U		0.01 U		0.011 U	
Xylene (total)	1,000	0.011 U		0.011 U		0.01 U		0.004 J		0.011 U		0.065	
		0.011 U		0.011 U		0.01 U		0.011 U		0.01 U		0.011 U	
Semi-Volatile Organic Compounds													
		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Benzo(a)anthracene	4	0.33 U		0.075 J		0.37 U		0.08 J		0.34 U		0.22 J	
		0.33 U		0.091 J		0.37 U		0.069 J		0.34 U		0.17 J	
Benzo(a)pyrene	0.66	0.33 U		0.097 J		0.37 U		0.089 J		0.34 U		0.14 J	
		0.33 U		0.064 J		0.37 U		0.045 J		0.34 U		0.14 J	
Benzo(b)fluoranthene	4	0.33 U		0.064 J		0.37 U		0.045 J		0.34 U		0.14 J	
		0.33 U		0.064 J		0.37 U		0.045 J		0.34 U		0.14 J	
Benzo(k)fluoranthene	4	0.33 U		0.064 J		0.37 U		0.045 J		0.34 U		0.14 J	
		0.33 U		0.064 J		0.37 U		0.045 J		0.34 U		0.14 J	
bis(2-Ethylhexyl)phthalate	210	0.95		0.51		0.33 J		1.7		0.26 J		1	
		0.95		0.51		0.33 J		1.7		0.26 J		1	
Dibenz(a,h)anthracene	0.66	0.33 U		0.36 U		0.37 U		0.34 U		0.34 U		0.036 J	
		0.33 U		0.36 U		0.37 U		0.34 U		0.34 U		0.036 J	
Indeno(1,2,3-cd)pyrene	4	0.33 U		0.057 J		0.37 U		0.041 J		0.34 U		0.078 J	
		0.33 U		0.057 J		0.37 U		0.041 J		0.34 U		0.078 J	
Pesticide & PCB													
		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Dieldrin	0.18	0.0034 U		0.017 U		0.0035 U		0.019 U		0.0041 U		0.0035 U	
		0.0034 U		0.017 U		0.0035 U		0.019 U		0.0041 U		0.0035 U	
Aroclor 1242	2	0.034 U		0.037 U		0.034 U		0.035 U		0.036 U		0.038 U	
		0.034 U		0.037 U		0.034 U		0.035 U		0.036 U		0.038 U	
Aroclor 1248	2	0.034 U		0.037 U		0.034 U		0.035 U		0.036 U		0.038 U	
		0.034 U		0.037 U		0.034 U		0.035 U		0.036 U		0.038 U	
Aroclor 1254	2	0.064		3.5 D		0.034 U		0.6		0.035 U		0.12	
		0.064		3.5 D		0.034 U		0.6		0.035 U		0.12	
Aroclor 1260	2	0.034 U		1 J		0.034 U		0.2		0.035 U		0.036 U	
		0.034 U		1 J		0.034 U		0.2		0.035 U		0.036 U	
Total Aroclor	2	0.064		4.5		0.034 U		0.8		0.035 U		0.12	
		0.064		4.5		0.034 U		0.8		0.035 U		0.12	
Metals													
		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	NC	2,680		3,620		3,260		3,330		3,280		1,200	
		2,680		3,620		3,260		3,330		3,280		1,200	
Antimony	340	0.35		14.9		0.79 J		16.4		1.7 J		17.3	
		0.35		14.9		0.79 J		16.4		1.7 J		17.3	
Arsenic	20	0.95 J		4.1		1.7 J		4		3.3		4.4	
		0.95 J		4.1		1.7 J		4		3.3		4.4	
Barium	47,000	7.6 J		50.3		13.9 J		42.9		21.1 J		14.5 J	
		7.6 J		50.3		13.9 J		42.9		21.1 J		14.5 J	
Beryllium	2	0.07 J		0.15 J		0.08 J		0.12 J		0.1 J		0.04 U	
		0.07 J		0.15 J		0.08 J		0.12 J		0.1 J		0.04 U	
Cadmium	100	0.09 J		1.5		0.19 J		2		0.43 J		0.07 U	
		0.09 J		1.5		0.19 J		2		0.43 J		0.07 U	
Copper	600	4 J		1,400		12.1		112		225		37.4	
		4 J		1,400		12.1		112		225		37.4	
Iron	NC	5,360		15,200		6,590		11,400		6,730		5,200	
		5,360		15,200		6,590		11,400		6,730		5,200	
Lead	600	4.8		468		53		1,560		124		2,170	
		4.8		468		53		1,560		124		2,170	
Manganese	NC	38.2		232		44.7		212		37.1		14.5	
		38.2		232		44.7		212		37.1		14.5	
Mercury	270	0.05 J		0.47		0.09		0.64		0.48		0.07 J	
		0.05 J		0.47		0.09		0.64		0.48		0.07 J	
Nickel	2,400	3.9 J		23.8		5 J		12		11.7		1.8 J	
		3.9 J		23.8		5 J		12		11.7		1.8 J	
Silver	110	0.15 U		0.38 J		0.25 J		0.35 J		0.16 J		0.15 U	
		0.15 U		0.38 J		0.25 J		0.35 J		0.16 J		0.15 U	
Sodium	4,100	17.9 U		76.3 J		18.1 U		74.6 J		19.1 J		59.4 J	
		17.9 U		76.3 J		18.1 U		74.6 J		19.1 J		59.4 J	
Thallium	2	0.75 U		0.77 U		0.76 U		0.75 U		0.76 U		0.79 U	
		0.75 U		0.77 U		0.76 U		0.75 U		0.76 U		0.79 U	
Zinc	1,500	16.8		246		39.5		230		163		22.4	
		16.8		246		39.5		230		163		22.4	
Soil Characteristics													
		Result		Result		Result		Result		Result		Result	
pH	NC	8.2		7.8		7.4		7.8		7		5.5	
		8.2		7.8		7.4		7.8		7		5.5	
Cyanide (mg/kg)	NC	NA		NA		NA		NA		NA		NA	
		NA		NA		NA		NA		NA		NA	

Notes:

- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample. U = Not detected above the Contact Required Quantitation Limit.
- Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99)
- J = Estimated value, below the CRQL.
- D = Sample diluted.
- NA = Not Available.
- Bold values indicate concentrations above MDL.
- All results in mg/kg.

TABLE 5-8
Matteo Iron and Metal

Deep Soil Sample Results (~10-12 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-12	GP-13	GP-14	GP-15	GP-16	GP-17	GP-18	GP-19	GP-20	GP-21
SAMPLE ID		GP-12C	GP-13C	GP-14C	GP-15C	GP-16C	GP-17C	GP-18C	GP-19C	GP-20C	GP-21C
LAB ID		N1314-4	N1314-7	N1314-10	N1315-2	N1315-5	N1315-8	N1315-11	N1313-3	N1313-6	N1313-9
DATE		10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001	10/23/2001
SAMPLE INTERVAL (BGS)		11.5-12	11.5-12	11.5-12	11-11.5	11.5-12	12-12.5	11.5-12	11.1-11.6	11-11.5	11.5-12
ANALYTE	NJDEP Non-Residential	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D
Volatile Organic Compounds											
Benzene	13	NA		NA		NA		NA		NA	
cis-1,2-Dichloroethene	1,000	NA		NA		NA		NA		NA	
Ethylbenzene	1,000	NA		NA		NA		NA		NA	
Vinyl chloride	7	NA		NA		NA		NA		NA	
Xylene (total)	1,000	NA		NA		NA		NA		NA	
Semi-Volatile Organic Compounds											
Benzo(a)anthracene	4	NA		NA		NA		NA		NA	
Benzo(a)pyrene	0.66	NA		NA		NA		NA		NA	
Benzo(b)fluoranthene	4	NA		NA		NA		NA		NA	
Benzo(k)fluoranthene	4	NA		NA		NA		NA		NA	
bis(2-ethylhexyl)phthalate	210	NA		NA		NA		NA		NA	
Dibenz(a,h)anthracene	0.66	NA		NA		NA		NA		NA	
Indeno(1,2,3-cd)pyrene	4	NA		NA		NA		NA		NA	
Pesticide & PCB											
Dieldrin	0.18	0.004 U I		0.0037 U I		0.0038 U I		0.0035 U		0.0036 U I	
Aroclor 1242	2	0.04 U I		0.037 U I		0.038 U I		0.036 U I		0.037 U I	
Aroclor 1248	2	0.04 U I		0.037 U I		0.038 U I		0.036 U I		0.037 U I	
Aroclor 1254	2	0.04 U I		0.037 U I		0.038 U I		0.036 U I		0.037 U I	
Aroclor 1260	2	0.04 U I		0.037 U I		0.038 U I		0.036 U I		0.037 U I	
Total Aroclor	2	0		0		0		0		0	
Metals											
Aluminum	NC	NA		NA		NA		NA		NA	
Antimony	340	NA		NA		NA		NA		NA	
Arsenic	20	NA		NA		NA		NA		NA	
Barium	47,000	NA		NA		NA		NA		NA	
Beryllium	2	NA		NA		NA		NA		NA	
Cadmium	100	NA		NA		NA		NA		NA	
Copper	600	NA		NA		NA		NA		NA	
Iron	NC	NA		NA		NA		NA		NA	
Lead	600	NA		NA		NA		NA		NA	
Manganese	NC	NA		NA		NA		NA		NA	
Mercury	270	NA		NA		NA		NA		NA	
Nickel	2,400	NA		NA		NA		NA		NA	
Silver	110	NA		NA		NA		NA		NA	
Sodium	4,100	NA		NA		NA		NA		NA	
Thallium	2	NA		NA		NA		NA		NA	
Zinc	1,500	NA		NA		NA		NA		NA	
Soil Characteristics											
pH	NC	7.23	I	8.14	I	4.93	I	7.18	I	5.35	I
Cyanide (mg/kg)	NC	NA		NA		NA		NA		NA	

Notes:

- * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any samp - U = Not detected above the Contact Required Quantitation Limit (CRQL).
- Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
- J = Estimated value, below the CRQL.
- D = Sample diluted
- NA = Not Available
- All results in mg/kg.

TABLE 5-8
Matteo Iron and Metal

Deep Soil Sample Results (~10-12 ft) from the Scrapyard - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		GP-22	GP-23	GP-24	GP-25	GP-26	GP-28	GP-29	GP-30	GP-31	GP-34		
SAMPLE ID		GP-22C	GP-23C	GP-24C	GP-25C	GP-26C	GP-28C	GP-29C	GP-30C	GP-31C	GP-34		
LAB ID		N1314-16	N1405-3	N1405-6	N1405-9	N1405-12	N1405-17	N1405-20	N1409-3	N1409-6	N12323-28		
DATE		10/23/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	10/24/2001	4/11/2002		
SAMPLE INTERVAL (BGS)		11-11.5	12-12.5	9.5-10	5-5.5	10-10.5	7.5-8	5.5-6	11.5-12	11.5-12	11 - 11.5		
ANALYTE	NJDEP Non-Residential	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Volatile Organic Compounds													
Benzene	13	NA			NA			NA			NA		
cis-1,2-Dichloroethene	1,000	NA			NA			NA			NA		
Ethylbenzene	1,000	NA			NA			NA			NA		
Vinyl chloride	7	NA			NA			NA			NA		
Xylene (total)	1,000	NA			NA			NA			NA		
Semi-Volatile Organic Compounds													
Benz(a)anthracene	4	NA			NA			NA			NA		
Benzo(a)pyrene	0.66	NA			NA			NA			NA		
Benzo(b)fluoranthene	4	NA			NA			NA			NA		
Benzo(k)fluoranthene	4	NA			NA			NA			NA		
bis(2-Ethylhexyl)phthalate	210	NA			NA			NA			NA		
Dibenzo(a,h)anthracene	0.66	NA			NA			NA			NA		
Indeno(1,2,3-cd)pyrene	4	NA			NA			NA			NA		
Pesticide & PCB													
Dieldrin	0.18	0.0035 U	1		0.0039 U	1		0.0038 U	1		0.0039 U	1	
Aroclor 1242	2	0.035 U	1		0.039 U	1		0.038 U	1		0.039 U	1	
Aroclor 1248	2	0.035 U	1		0.039 U	1		0.038 U	1		0.039 U	1	
Aroclor 1254	2	0.035 U	1		0.039 U	1		0.038 U	1		0.039 U	1	
Aroclor 1260	2	0.035 U	1		0.039 U	1		0.038 U	1		0.039 U	1	
Total Aroclor	2	0			0			0			0		
Metals													
Aluminum	NC	2,510	1		2,400	1		5,820	1		2,970	1	
Antimony	340	0.45 U	1		0.46 U	1		0.45 U	1		11.2 J	1	
Arsenic	20	0.5 U	1		0.84 J	1		1.8 J	1		1.9 J	1	
Barium	47,000	7.1 J	1		5.5 J	1		10.5 J	1		1.5 J	1	
Beryllium	2	0.08 J	1		0.03 J	1		0.12 J	1		3.7	1	
Cadmium	100	0.06 U	1		0.07 U	1		0.06 U	1		1.6 J	1	
Copper	600	2.4 J	1		3.1 J	1		4.3 J	1		4.9 J	1	
Iron	NC	3580	1		2420	1		5,920	1		0.21 J	1	
Lead	600	2.2	1		3.4	1		4	1		0.11 J	1	
Manganese	NC	39.4	1		10.2	1		41.2	1		0.07 U	1	
Mercury	270	0.03 J	1		0.04 U	1		0.03 U	1		0.07 U	1	
Nickel	2,400	3.7 J	1		2.1 J	1		5.2 J	1		0.03 U	1	
Silver	110	0.15 U	1		0.15 U	1		0.16 U	1		0.03 U	1	
Sodium	4,100	20.8 U	1		60.2 J	1		51.6 U	1		0.03 U	1	
Thallium	2	NA			NA			NA			0.04 U	1	
Zinc	1,500	11.1	1		28.1	1		19.3	1		0.15 U	1	
Soil Characteristics													
pH	NC	6.21	1		7.72	1		7.34	1		0.16 U	1	
Cyanide (mg/kg)	NC	0.05 U	1		0.06 UN	1		0.06 UN	1		100 J	1	
											540 U	1	
											1.1 U	1	
											1.1 U	1	
											2.9	1	
											36.8	1	
											0.033 U	1	
											4.3 U	1	
											1.1 U	1	
											540 U	1	
											1.1 U	1	
											22.4	1	
											</		

Notes:
 - * NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any * - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99).
 - Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - J = Estimated value, below the CRQL.
 - D = Sample diluted.
 - NA = Not Available.

TABLE 5-9
Matteo Iron and Metal
Soil Boring Sample Analytical Results

SAMPLE LOCATION			MW1		B16		B18	
SAMPLE ID			MW-1A	MW-1B	MW16A	MW16B	MW-18A	MW-18B
LAB ID			E77442-5	E77442-6	E78265-2	E78265-3	E78510-11	E78510-12
DATE			9/25/2000	9/25/2000	10/5/2000	10/5/2000	10/10/2000	10/10/2000
SAMPLE INTERVAL (BGS)			1.0-1.5	10-10.5	2-2.5	6.5-7	3-4	5-6
ANALYTE	RSCC	NRSCC						
Volatile Organic Compounds								
Benzene	3	13	0.009 U	0.011 U	0.012 U	0.021 U	0.009 U	0.01 U
Chloroform	19	28	0.009 U	0.011 U	0.012 U	0.021 U	0.009 U	0.01 U
cis-1,2-Dichloroethene	79	1,000	0.009 U	0.011 U	0.012 U	0.021 U	0.009 U	0.01 U
Ethylbenzene	1,000	1,000	0.009 U	0.011 U	0.012 U	0.021 U	0.009 U	0.01 U
Vinyl chloride	2	7	0.009 U	0.011 U	0.012 U	0.021 U	0.009 U	0.01 U
Xylene (total)	410	1,000	0.009 U	0.011 U	0.012 U	0.021 U	0.009 U	0.01 U
Semi-Volatile Organic Compounds								
2,4-Dimethylphenol	1,100	10,000	0.35 U	0.36 U	0.51 U	0.53 U	0.38 U	0.39 U
Benzo(a)anthracene	0.9	4	0.35 U	0.36 U	0.24	0.53 U	0.38 U	0.39 U
Benzo(a)pyrene	0.66	0.66	0.35 U	0.36 U	3.3 N	0.53 U	0.38 U	0.39 U
Benzo(b)fluoranthene	0.9	4	0.35 U	0.36 U	2.8	0.53 U	0.38 U	0.39 U
Benzo(k)fluoranthene	0.9	4	0.35 U	0.36 U	2.2	0.53 U	0.38 U	0.39 U
bis(2-Ethylhexyl)phthalate	49	210	0.07 J	0.36 U	29	0.075 J	0.38 U	0.39 U
Dibenz(a,h)anthracene	0.66	0.66	0.35 U	0.36 U	1	0.53 U	0.38 U	0.39 U
Indeno(1,2,3-cd)pyrene	0.9	4	0.35 U	0.36 U	2.2	0.53 U	0.38 U	0.39 U
Pesticide & PCB								
Dieldrin	0.042	0.18	0.0034 U	0.0037 U	0.0051 U	0.005 U	0.0039 U	0.004 U
Aroclor 1248	0.49	2	0.034 U	0.037 U	0.2	0.050 U	0.039 U	0.040 U
Aroclor 1254	0.49	2	0.034 U	0.037 U	0.68	0.050 U	0.039 U	0.040 U
Aroclor 1260	0.49	2	0.034 U	0.037 U	0.051 U	0.050 U	0.039 U	0.040 U
Total Aroclor	0.49	2	0.034 U	0.037 U	0.88	0.050 U	0.039 U	0.040 U
Metals								
Aluminum	NC	NC	3,240	1,370	12,700	9,400	3,030	4,250
Antimony	14	340	2 J	0.43 J	13.3 J	0.56 U	2.8 J	0.43 J
Arsenic	20	20	1.4 J	0.48 U	16	8.2	4.9	8
Barium	700	47,000	24.9 J	7.3 J	391	73.4	8.3 J	4.5 J
Beryllium	2	2	0.2 J	0.05 J	0.43 J	0.57 J	0.16 J	0.35 J
Cadmium	39	100	0.07 U	0.06 U	3.8 J	0.28 J	0.07 U	0.07 U
Copper	600	600	7	3.7 J	469	8.5	2.3 J	2 J
Iron	NC	NC	5,750	3,680	153,000	10,700	10,400	15,500
Lead	400	600	79.2	16.4	2,460 N	22.7	2.9	2.4
Manganese	NC	NC	41.4	15.2	561	76	16.6	22.3
Mercury	14	270	0.05 U	0.05 U	1.2	0.06 U	0.05 U	0.05 U
Nickel	250	2,400	4 J	2 J	60.1	10.1 J	3.4 J	2.6 J
Silver	110	4,100	0.15 U	0.15 U	3.6 J	0.23 U	0.17 U	0.16 U
Sodium	NC	NC	18.7 U	18 U	585 J	243 J	38.5 J	46.8 J
Thallium	2	2	0.78 U	0.75 U	2.8 U	1.2 U	0.86 U	0.83 U
Zinc	1,500	1,500	209	7.8	1,680 N	40.9	11.7	18.2

Notes:

- Compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- RSCC: New Jersey Residential Soil Cleanup Criteria
- NRSCC: New Jersey Non-Residential Soil Cleanup Criteria
- Shaded values exceed New Jersey Residential Direct Contact Soil Criteria
- Shaded values with an "N" exceed New Jersey Non Residential and Residential Direct Contact Soil Cleanup Criteria
- Bold values indicate concentrations above MDL
- All results in mg/kg
- U = Not detected above the Contract Required Quantitation Limit (CRQL)
- J = Estimated value, below the CRQL

TABLE 5-10
Matteo Iron and Metal
Soil Boring Sample TOC Results

Sample Location	Sample ID	Lab ID	Date	Depth ft bgs	TOC mg/kg	pH
MW1	MW1C	E77442-7	9/25/2000	14-16	<120	4.2
MW2	MW-2A	E77159-15	9/18/2000	12-14	223	5.1
MW3	MW-3A	E77159-16	9/18/2000	10-12	456	5.4
MW4	MW-4A	E76949-15	9/19/2000	8-9.5	730	5.2
MW5	MW-5A	E77159-17	9/19/2000	12-14	5,780	4.7
MW6	MW-6A	E76949-16	9/20/2000	8-10	1,300	5.5
	MW-6DUP	E76949-17	9/20/2000	8-10	1,610	5.2
MW7	MW-7A	E76949-18	9/21/2000	8.5-10	<110	6.8
MW8	MW8A	E77442-3	9/25/2000	14-16	708	4.5
	MW8B	E77442-4	9/25/2000	16-18	359	4.2
MW9	MW-9A	E77442-1	9/22/2000	10-12	1,000	6.4
MW10	MW-10A	E77442-2	9/22/2000	10-12	413	6.1
MW11	MW-11A	E76949-19	9/21/2000	6-8	600	7
MW12	MW-12A	E76949-20	9/21/2000	6-8.5	722	7
B13	MW13A	E78510-17	10/10/2000	6-7	1,020	4.7
	MW13B	E78510-18	10/10/2000	12-13	12,600	4.9
	MW-13C	E78671-13	10/13/2000	30-36.5	356	5.4
	MW-13D	E78671-14	10/13/2000	55-60.5	381	6
	DUP TOC	E78963-10	10/16/2000	85-86	1,380	4.9
B14	MW14-A	E77892-1	9/29/2000	6-8	1,090	8.1
	MW14-B	E77892-2	9/29/2000	18-20	9,320	5.5
	MW14-C	E78043-1	10/2/2000	45-47	2,150	5.2
	MW14-D	E78043-2	10/2/2000	75-77	2,080	5.7
B15	MW-15A	E78043-12	10/3/2000	2-8	418	7.1
	MW-15B	E78043-13	10/3/2000	8-12	9,340	4.9
	MW-15C	E78043-14	10/3/2000	25-32	269	5.6
	MW-15E	E78043-15	10/3/2000	45-52	672	6.6
	MW15-E	E78265-1	10/4/2000	80-87	314	7.2
B16	MW16C	E78265-4	10/5/2000	10-11.5	2,220	8
	MW16D	E78266-12	10/6/2000	45-46	130	8
	MW16E	E78266-13	10/6/2000	50-51	350	6.7
	MW16F	E78266-14	10/6/2000	60-61	49,700	5.6
	MW16G	E78510-9	10/9/2000	85-86	4,090	5.9
	MW16H	E78510-10	10/9/2000	90-91	22,000	6.6
B17	MW17D-A	E76840-5	9/14/2000	4-5.5	300	5.2
	MW17D-B	E76840-6	9/14/2000	9-10.5	17,300	4.4
	MW17D-C	E76840-7	9/14/2000	18-19	<240	4.2
	MW17D-D	E76840-8	9/14/2000	45-46	1,960	4.8
	MW17D-E	E76840-9	9/14/2000	65-66	3,890	5.3
	MW17D-F	E76840-10	9/14/2000	75-76	16,400	5.3
	MW17D-G	E76949-2	9/15/2000	85-86	73,600	6
B18	MW18C	E78510-13	10/10/2000	6-7	198	6.4
	MW18D	E78510-14	10/10/2000	16-17	227	6.8
	MW18E	E78510-15	10/10/2000	25-26	275	7.8
	MW18F	E78510-16	10/10/2000	50-51	356	7.2

TABLE 5-11
Matteo Iron Metal
Soil Sample Sample Results - Lead/TPH/pH

Sample Location	Sample ID	Lab ID	Date	Depth ft bgs	TPHC mg/kg	Lead		pH
						Res. 400	Non Res. 600	
New Jersey Residential Soil Cleanup Criteria					10,000			NC
TP1A	TP-1A	E76234-3	9/6/2000	1.5-2	903	25,600		5.5
TP1B	TP-1B	E76234-4	9/6/2000	6-6.5	535	8,040		6.8
TP1B	TPDUP-1	E76234-6	9/6/2000	6-6.5	1,080	6,270		6.5
TP1C	TP-1C	E76234-5	9/6/2000	2.5-3	956	12,000		5.8
TP2B	TP-2B	E76419-12	9/7/2000	3-3.5	248	821		6.1
TP2C	TP-2C	E76419-13	9/7/2000	7-7.5	116	200		5.6
TP3A	TP-3A	E76419-14	9/7/2000	1.5-2	239	31,300		5.7
TP3B	TP-3B	E76419-15	9/7/2000	4.5-5	< 26	5.6		7.5
TP4A	TP-4A	E76419-16	9/7/2000	2-2.5	88.5	10,600		6.2
TP4B	TP-4B	E76419-17	9/7/2000	2-2.5	< 28	16.3		6.6
TP4C	TP-4C	E76419-18	9/7/2000	5.5-6	120	5,080		4.9
TP4D	TP-4D	E76418-14	9/7/2000	13-14	< 31	14.1		3.7
TP5A	TP-5A	E76419-8	9/8/2000	2.5-3	< 33	8.6		4.1
TP5A	TPDUP2	E76419-9	9/8/2000	2.5-3	< 33	10.4		4.2
TP6B	TP-6B	E76419-7	9/8/2000	11-11.5	29.7	2		5.7
TP7A	TP-7A	E76419-3	9/8/2000	10-11	< 28	5.1		5.4
TP8A	TP-8A	E76419-2	9/8/2000	8-8.5	< 29	6.6		5
TP9A	TP-9A	E76419-1	9/8/2000	7.5-8	< 42	933		5.6
TP10A	TP-10A	E76571-1	9/11/2000	12-12.5	< 29	4.4		4.7
TP11A	TP-11A	E76571-2	9/11/2000	2-2.5	< 27	3.2		7.2
TP13A	TP-13A	E76571-3	9/11/2000	9.5-10	117	61		6.1
TP14A	TP-14A	E76571-4	9/11/2000	6.5-7	< 29	26.2		4.4
TP15	TP-15A	E76571-5	9/11/2000	9-9.5	< 30	30.1		6.5
TP16	TP-16A	E76571-6	9/11/2000	10.5-11	< 32	222		5.5
TP17	TP-17A	E76571-7	9/11/2000	6-6.5	< 29	3.7		4.5
TP19	TP-19	E76651-2	9/12/2000	6.5-7	< 39	20.2		5.7
TP20	TP-20	E76651-3	9/12/2000	8.5-9	< 30	2.4		6.6
TP21	TP-21	E76651-4	9/12/2000	11.5-12	< 29	1.7		6.7
TP22	TP-22	E76651-5	9/12/2000	13.5-14	< 30	4.5		4.7
TP23	TP-23	E76651-6	9/12/2000	13-13.5	< 26	2		5
TP24	TP-24	E76651-7	9/12/2000	8-8.5	< 31	4.5		4.6
TP26	TP-26	E76651-9	9/12/2000	8.5-9	< 27	1.7		6.8
TP27	TP-27A	E76651-10	9/13/2000	1.5-2	315	750		6.9
TP27	TP-27B	E76651-11	9/13/2000	3-3.5	< 29	17.7		7
TP28	TP-28A	E76651-12	9/13/2000	2-2.5	89.9	7,930		6.1
TP28	TP-28B	E76651-13	9/13/2000	3.5-4	47.9	262		5.6
TP30	TP-30	E76651-16	9/13/2000	11.5-12	< 28	2.3		6.2
TP31	TP-31	E76651-17	9/13/2000	3-3.5	< 27	2.3		6.8
TP34	TP-34	E76651-19	9/13/2000	2-2.5	29.6	1.7		6
TP36	TP-36A	E76839-2	9/14/2000	3-3.5	< 29	3.6		5.2

Notes:

- New Jersey Residential and Non Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99)
- Bold and Shaded values exceed New Jersey Residential and Non Residential Soil Cleanup Criteria.
- No sample exceeded Impact to Groundwater Criteria.
- All results in mg/kg.

TABLE 5-11
Matteo Iron Metal
Soil Sample Results - Lead/TPH/pH

Sample Location	Sample ID	Lab ID	Date	Depth ft bgs	TPHC mg/kg	Lead		pH
						Res. 400	Non Res. 600	
New Jersey Residential Soil Cleanup Criteria					10,000			NC
TP36	TP-36B	E76839-3	9/14/2000	12.5-13	< 33	12.9		6
TP37	TP-37	E76839-4	9/14/2000	12.5-13	< 30	2.7		6.2
TP38	TP-38	E76839-5	9/14/2000	4-4.5	< 189	1,650		6
TP39	TP-39	E76839-6	9/14/2000	9.5-10	< 32	3.7		6.1
TP40	TP-40	E76839-7	9/14/2000	9-9.5	< 288	294		6
TP41	TP-41	E76839-8	9/14/2000	6-6.5	< 191	3,600		6
TP42	TP-42A	E76839-9	9/14/2000	3-3.5	< 30	37.7		5.3
TP42	TP-42B	E76839-10	9/14/2000	8.5-9	< 31	1.8		6.3
TP43	TP-43	E76839-11	9/14/2000	12.5-13	< 34	6.6		4.7
TP46	TP-46	E76949-3	9/15/2000	14.5-15	< 28	5.5		6.6
TP46	TP-DUP5	E76949-4	9/15/2000	14.5-15	< 28	2.6		6.6
TP48	TP-48B	E76949-7	9/15/2000	8.5-9	< 30	16.6		5.4
TP50	TP-50B	E76949-10	9/15/2000	13.5-14	< 28	1.4		5.2
TP51	TP-51A	E77159-1	9/18/2000	3-3.5	2,250	1,680		6.6
TP51	TP-DUP6	E77159-2	9/18/2000	3-3.5	442	1,320		5.9
TP51	TP-51B	E77159-3	9/18/2000	12.5-13	< 34	21.8		5.1
TP52	TP-52	E77159-4	9/18/2000	4-4.5	74	128		6.2
TP54	TP-54	E77159-6	9/18/2000	14.5-15	< 29	7.7		4.1
TP56	TP-56B	E77159-9	9/18/2000	12-12.5	< 29	62.2		6.9
TP62	TP-62A	N1241-4	10/22/2001	0.3-0.8	297	1,110		6.18
TP64	TP-64A	N1312-2	10/23/2001	9-10	< 28	14.7		4.48
TP65	TP-65A	N1312-3	10/23/2001	4-4.5	< 29	3.4		4.77
TP68	TP-68A	N1312-5	10/23/2001	3-3.5	< 29	6.8		4.76
TP71	TP-71A	N1315-13	10/24/2001	6-6.5	< 29	2.7		7.24
TP71	DUP-2	N1315-17	10/24/2001	6-6.5	< 28	1.8		6.94
TP73	TP-73A	N1315-15	10/24/2001	8-8.5	146	54.5		5.37
TPSS-A	TPSS-A1	E76949-11	9/15/2000	0-0.5	64.4	161		6.8
	TPSS-A2	E76949-1	9/15/2000	3.5-4.5	< 26	34.7		6.5
TPSS-B	TPSS-B1	E76949-12	9/15/2000	0-0.5	31.6	331		6.4
TPSS-C	TPSS-C1	E76949-13	9/15/2000	0-0.5	2,080	14,500		6.1
TPSS-F	TPSS-F1	E77159-12	9/19/2000	0-0.5	63.8	4,980		6.4
TPSS-G	TPSS-G1	E77159-13	9/19/2000	0-0.5	61.4	1,660		6.4
TPSS-H	TPSS-H1	E77159-14	9/19/2000	0-0.5	118	9,830		6

Notes:

- New Jersey Residential and Non Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99)
- Bold and Shaded values exceed New Jersey Residential and Non Residential Soil Cleanup Criteria.
- No sample exceeded Impact to Groundwater Criteria.
- All results in mg/kg.

TABLE 5-12
Matteo Iron Metal
Test Pit Soil Sample Results - Residential Criteria (RSCC)

SAMPLE LOCATION		TP2A	TP4A	TP6A	TP8A	TP10	TP12	TP14	TP16	TP18	TP20	TP22	TP24	TP26	TP28	TP30	TP32	TP34	TP36	TP38	TP40
SAMPLE ID		TP-2A	TP-4A	TPDUP1	TP-6C	TPD0	TP-7B	TP-11	TP-23	TP-25	TP-27	TP-29	TP-31	TP-33	TP-35	TP-37	TP-39	TP-41	TP-43	TP-45	TP-47
LAB ID		E76419-11	E76419-6	E76419-11	E76419-5	E76419-14	E76419-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1	E76411-1
DATE		9/7/2000	9/8/2000	9/8/2000	9/8/2000	9/13/2000	9/8/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000
SAMPLE INTERVAL (RCS)		3-3	6-3	6-3	2-2.5	1-1.5	1-1.5	1-1.5	2-2.5	2-2.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Volatile Organic Compounds		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Benzene	3	0.029 U	0.015	0.015	0.022	0.022	0.008 U	0.01 U	0.011 U	0.005 J	0.011 U	0.011 U	0.005 J	0.011 U	0.011 U	0.005 J	0.011 U	0.011 U	0.005 J	0.011 U	0.011 U
Chloroform	19	0.029 U	0.009 U	0.008 U	0.011 U	0.011 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
1,1,2-Trichloroethane	79	0.029 U	0.009 U	0.008 U	0.011 U	0.011 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Ethylbenzene	1,000	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Vinyl chloride	2	0.029 U	0.009 U	0.008 U	0.011 U	0.011 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Xylene (total)	410	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Semi-Volatile Organic Compounds		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
1,1-Dimethylphenol	1,100	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
1,2-Dichlorobenzene	0.9	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Benzonitrile	0.66	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Benzophenone	0.9	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Benzonitrile	0.9	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
1,2,4-Trichlorobenzene	49	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
1,2,4-Trichlorobenzene	0.66	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
1,2,4-Trichlorobenzene	0.9	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Pesticides & PCBs		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Dieldrin	0.042	0.009 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Aroclor 1248	0.49	0.009 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Aroclor 1254	0.49	0.009 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Aroclor 1260	0.49	0.009 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Total PCBs	0.49	0.009 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Metals		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Aluminum	NC	7,950	1,930	1,930	8,980	1,980	2,740	2,740	1,470	10,500	1,170	3,500	12,100	14,600	13,600	13,600	13,600	13,600	13,600	13,600	13,600
Antimony	14	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Arsenic	20	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Barium	700	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Beryllium	7	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Cadmium	39	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Copper	600	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Iron	NC	181,000	8,700	8,700	6,800	2,010	11,400	3,060	13,800	3,120	7,350	14,100	40,200	41,200	24,100	24,100	24,100	24,100	24,100	24,100	24,100
Lead	400	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Manganese	256	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Mercury	14	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Nickel	230	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Silver	110	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Sodium	NC	70.8 J	18.3 U	18.4 U	23.5 J	936 J	23.5 J	31.3 J	38.8 J	90.1 J	36.1 J	36.1 J	195 J	174 J	171 J	171 J	171 J	171 J	171 J	171 J	171 J
Thallium	2	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Zinc	1,300	0.029 U	0.009 U	0.008 U	0.012 U	0.012 U	0.008 U	0.01 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U	0.003 U	0.011 U	0.011 U
Soil Characteristics		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
pH	NC	3	3.4	4.7	5.9	6.6	6.7	7.4	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Organic	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: - NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
- Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99). Bold values indicate concentrations above MDL.
- All results in mg/kg.
- D = Sample diluted.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- J = Estimated value, below the CRQL.

TABLE S-12
Matteo Iron Metal
Test Pit Soil Sample Results - Residential Criteria (RSCC)

SAMPLE LOCATION		TP45	TP45	TP47	TP48	TP49	TP50	TP53	TP53	TP53	TP56	TP60	TP61	TP61	TP64
SAMPLE ID		TP-45A	TP-45B	TP-47	TP-48A	TP-49	TP-50A	TP-53	TP-53	TP-53	TP-56A	TP-60A	TP-61A	TP-61B	TP-64B
LAB ID		E76839-13	E76839-14	E76949-5	E76949-6	E76949-8	E76949-9	E77159-5	E77159-7	E77159-8	E77159-8	N1241-1	N1241-2	N1241-3	N1241-1
DATE		9/14/2000	9/14/2000	9/15/2000	9/15/2000	9/15/2000	9/15/2000	9/18/2000	9/18/2000	9/18/2000	10/22/2001	10/22/2001	10/22/2001	10/22/2001	10/22/2001
SAMPLE INTERVAL (BGS)		1-5	2-5	12-5-13	1-15	1-15	1-15	12-5-13	7-5	2-5	1-5	1-15	6-6	6-6	9-10
ANALYTE		NJDEP													
Volatile Organic Compounds		Residential													
Benzene		3	0.58 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U	0.01 U
Chloroform		19	1.3 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U	0.01 U
cis-1,2-Dichloroethene		79	4.6 U	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U	0.01 U
Ethylbenzene		1,000	3.7 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U	0.01 U
Vinyl chloride		2	4.6 U	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U	0.01 U
Xylene (total)		410	37	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U	0.01 U
Semi-Volatile Organic Compounds		Residential													
1,4-Dimethylphenol		1,100	35 U	0.34 U	0.41 U	0.37 U	0.39 U	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Benz(a)anthracene		0.9	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Benz(b)fluoranthene		0.66	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Benz(k)fluoranthene		0.9	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Benz(a)pyrene		0.9	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Benzo(b)fluoranthene		0.9	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Benzo(e)pyrene		0.9	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Dibenz(a,h)anthracene		0.66	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Indeno(1,2,3-cd)pyrene		0.9	1.8 U	0.34 U	0.41 U	0.36 J	0.36 J	0.36 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U	0.35 U	0.38 U
Pesticide & PCB		Residential													
Dieldrin		0.042	0.018 U	0.0016 U	0.0041 U	0.0037 U	0.0037 U	0.0035 U	0.0045 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.004 U
Aroclor 1248		0.49	0.036 U	0.0016 U	0.0041 U	0.0037 U	0.0037 U	0.0035 U	0.0045 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.004 U
Aroclor 1254		0.49	0.036 U	0.0016 U	0.0041 U	0.0037 U	0.0037 U	0.0035 U	0.0045 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.004 U
Aroclor 1260		0.49	0.036 U	0.0016 U	0.0041 U	0.0037 U	0.0037 U	0.0035 U	0.0045 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.004 U
Total PCBs		0.49	0.036 U	0.0016 U	0.0041 U	0.0037 U	0.0037 U	0.0035 U	0.0045 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.004 U
Metals		Residential													
Aluminum		NC	2,600	1,840	7,040	1,970	1,910	2,350	13,600	1,860	1,760	3,990	1,210	1,670	2,170
Antimony		14	1.6 J	0.39 U	1.6 J	1.9 J	1.1 J	0.16 U	0.79 J	0.34 U	0.15 U	0.14 U	0.14 U	0.16 J	0.5 U
Arsenic		20	5.3	3	22.3	2.2 J	3	2.1	24.1	3.2	3.9	7.4	2.5	3.3	4.1
Barium		700	43	6.4 J	25.6 J	18.9 J	18 J	16.7 J	27 J	9.1 J	6.8 J	6.6 J	8.9 J	8 J	4.9 J
Beryllium		2	0.18 J	0.15 J	0.91 J	0.16 J	0.13 J	0.15 J	1.4 J	0.13 J	0.12 J	0.17 J	0.1 J	0.12 J	0.17 J
Cadmium		39	0.98 J	0.06 U	0.07 U	0.07 U	0.13 J	0.06 J	0.03 U	0.06 J	0.06 U	0.06 U	0.06 U	0.07 U	0.07 U
Copper		600	16.5	3.6 J	3.9 J	6.1	14.5	6.9	5.9 J	2.2 J	0.88 J	2.4 J	2.6 J	3.1 J	15.8 J
Iron		NC	16,100	9,450	71,100	4,440	8,120	4,570	34,000	6,450	6,640	13,100	4,080	7,320	10,800
Lead		400	9.1	8.6	51.9	108	104	10.2	19.5	26.9	11.8	32.7	10.6	24.1	82.9
Manganese		NC	149	45.2	181	57	74.1	50.6	86.5	26.9	11.8	32.7	10.6	24.1	82.9
Mercury		14	0.04 J	0.04 U	0.06 U	0.04 U	0.05 U	0.04 U	0.05 U	0.01 U	0.04 U	0.04 U	0.04 J	0.04 J	0.01 U
Nickel		250	64.6	5.9 J	16.5	3.3 J	5.2 J	4.3	15.5	3.7 J	1.6 J	1.9 J	2.4 J	1.6 J	1.6 J
Silver		110	0.17 J	0.15 U	0.16 U	0.15 U	0.15 U	0.14 U	0.19 U	0.14 U	0.14 U	0.15 U	0.15 U	0.16 U	0.17 U
Sodium		NC	96.3 J	25.7 J	19.7 U	19.4 J	18.7 U	16.9 U	59.5 J	27.1 J	32.5 J	89.7 J	75.8 J	89 J	10.5 J
Thallium		2	0.76 U	0.75 U	0.82 U	0.79 U	0.78 U	0.71 U	0.93 U	0.73 U	0.72 U	NA	NA	NA	NA
Zinc		1,500	1,570	14.5	44.8	32.4	42.1	34.5	68.3	59.5	6.5	13.3	27.7	46.9	11.3
Soil Characteristics		Residential													
pH		NC	6	5.1	5.4	5.7	6.6	5.7	4.3	7.2	7.2	6.95	5.71	7.77	5.99
Cyanide		NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.05 U	0.05 U

Notes: - NJDEP RSCC = New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 3/5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample
 - Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 3/5/99) Bold values indicate concentrations above MDL
 - All results in mg/kg.
 - U = Sample diluted.
 - J = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-12
Malleo Iron Metal

[illegible]

Notes: NIDEP RSCC - New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D-1.999) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed New Jersey Residential Soil Cleanup Criteria (N.J.A.C. 7:26D-1.999). Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - D = Sample disturbed.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-13
Matteo Iron Metal
Test Pit Soil Sample Results - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION	TP2A	TP6A	TP6A	TP6B	TP6B	TP7A	TP18	TP25	TP28	TP29	TP32	TP35	TP35	TP44
SAMPLE ID	TP-2A	TP-6A	TPDUP3	TP-6C	TP6D	TP-7D	TP-18	TP-25	TP-28C	TP-29	TP-32	TP-35	TP-DUP4	TP-44
LAB ID	E76419-11	E76419-6	E76419-11	E76419-5	E76419-14	E76419-4	E76651-1	E76651-8	E76651-14	E76651-15	E76651-18	E76651-20	E76839-1	E76839-12
DATE	9/7/2000	9/8/2000	9/8/2000	9/8/2000	9/15/2000	9/8/2000	9/12/2000	9/12/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/14/2000	9/14/2000
SAMPLE INTERVAL (BGS)	3-5	6-6.5	6-6.5	2-2.5	1-1.5	1.5-2	8-8.5	2-2.5	0-0.5	9.5-10	1.5-2	5-5.5	5-5.5	2-2.5
ANALYTE	NJDEP Non Residential	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Volatiles Organic Compounds														
Benzene	13	0.029 U	0.015	0.003 J	0.022	0.044	0.008 U	0.01 U	0.011 U	0.005 J	0.011 U	NT	0.033 U	0.025 U
Chloroform	28	0.029 U	0.009 U	0.008 U	0.011 U	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U
cis-1,2-Dichloroethene	1,000	0.029 U	0.009 U	0.008 U	0.011 U	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U
Ethylbenzene	1,000	0.029 U	0.009 U	0.008 U	0.12 U	120	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U
Vinyl chloride	7	0.029 U	0.009 U	0.008 U	0.011 U	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U
Xylene (total)	1,000	0.029 U	0.009 U	0.008 U	0.27 U	560	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U
Semi-Volatile Organic Compounds														
2,4-Dimethylphenol	10,000	0.71 U	0.37 U	0.36 U	0.04 U	NT	0.38 U	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.68 U	0.68 U
Benzo(a)anthracene	4	0.1 J	0.37 U	0.36 U	0.23 J	NT	0.038 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.34 J	0.1 J
Benzo(b)pyrene	0.66	0.71 U	0.37 U	0.36 U	0.073 J	NT	0.039 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.33 J	0.11 J
Benzo(k)fluoranthene	4	0.71 U	0.37 U	0.36 U	0.099 J	NT	0.042 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.29 J	0.1 J
Benzo(e)fluoranthene	4	0.71 U	0.37 U	0.36 U	0.068 J	NT	0.032 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.24 J	0.094 J
bis(2-Ethylhexyl)phthalate	210	1.1	0.048 J	0.047 J	1.3	NT	0.043 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.051 J	0.044 J
Dibenzo(a,h)anthracene	0.66	0.71 U	0.37 U	0.36 U	0.4 U	NT	0.38 U	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.073 J	0.68 U
Indeno(1,2,3-cd)pyrene	4	0.71 U	0.37 U	0.36 U	0.049 J	NT	0.027 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.16 J	0.06 J
Pesticide & PCB														
Dieldrin	0.18	0.035 U	0.0038 U	0.0036 U	0.0039 U	NT	0.0038 U	0.0039 U	0.0041 U	0.025 U	0.0043 U	0.0036 U	0.0073 U	0.0066 U
Aroclor 1248	2	0.069 U	0.038 U	0.036 U	0.039 U	NT	0.038 U	0.039 U	0.041 U	0.25 U	0.043 U	0.036 U	0.073 U	0.066 U
Aroclor 1254	2	0.069 U	0.038 U	0.036 U	0.53	NT	0.24	0.039 U	0.041 U	0.25 U	0.043 U	0.25	11 U	26
Aroclor 1260	2	0.069 U	0.038 U	0.036 U	0.039 U	NT	0.038 U	0.039 U	0.041 U	0.25 U	0.043 U	0.036 U	5.1 U	22
Total PCBs	2	0.069 U	0.038 U	0.036 U	0.53	NT	0.24	0.039 U	0.041 U	0.25 U	0.043 U	0.25	16.1 U	48
Metals														
Aluminum	NC	7,950	1,800	1,930	8,980	1,980	2,940	2,790	1,470	10,500	1,270	3,500	19,200	14,600
Antimony	340	17.7 J	7.8 J	5.5 J	20.7	21.4	4.7 J	0.39 U	0.42 U	2.8 J	0.43 U	208	62.9	20.2 J
Arsenic	20	9.7	5.4	5	3.9	0.62 U	5.7	0.53 U	5.7	21.4	4.3	14.8	26.4	21.3
Barium	47,000	496	12.4 J	13.4 J	11.6 J	15.3 J	36.1 J	17.8 J	3.7 J	25 J	3.6 J	30.5 J	179	138
Beryllium	2	0.14 J	0.16 J	0.17 J	0.11 J	0.07 J	0.25 J	0.22 J	0.24 J	0.96 J	0.19 J	0.35 J	2.2	1.5 J
Cadmium	100	5.3	0.06 U	0.06 U	0.51 J	1.5 J	0.07 U	0.45 J	0.07 U	1.6	0.08 U	0.36 J	4.9	4.8
Copper	600	279	5.8	4.8 J	327	110	14.3	108	0.88 J	38.7	0.82 J	7.4	132	187
Iron	NC	101,000	8,780	8,530	6,880	2,010	11,400	3,060	13,800	3,220	7,350	14,100	40,200	41,700
Lead	600	12.4	10.6	91.8	89.8	881	82.5	2.3	41.4	2.7	20.4	11,500	4,030	218
Manganese	NC	256	11.9	20.8	120	1,350	40.8	15.2	10	33	6.6	56.3	679	756
Mercury	270	0.57	0.05 J	0.06 J	0.41	0.06 U	0.15	0.05 U	0.05 U	0.14	0.05 U	0.06 J	1.3	1.2
Nickel	2,400	68.7	12.5	11.6	185	234	4.3 J	4 J	1.2 J	5.8 J	0.88 J	8.4 J	47.2	38.2
Silver	4,100	32.7	0.15 U	0.15 U	0.32 J	0.19 U	0.15 U	0.16	0.17 U	0.2 U	0.18 U	0.15 U	19	143
Sodium	NC	70.8 J	18.3 U	18.4 U	23.5 J	936 J	232 J	32.3 J	38.8 J	90.1 J	36 J	36.1 J	195 J	174 J
Thallium	2	1.5 U	0.76 U	0.77 U	0.82 U	3.9 U	0.78 U	0.83 U	0.89 U	1 U	0.92 U	0.77 U	1.5 U	1.4 U
Zinc	1,500	1610	21.9	20.9	472	31.4	47.4	84.7	5.9	367	6	40	694	516
Soil Characteristics														
pH	NC	5	5.4	4.7	5.9	6.6	6.7	7.4	6.6	6.7	6.7	6.7	5.6	5.3
Cyanide	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D-5.999) compounds not listed did not meet or exceed soil cleanup criteria in any sample.

- Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D-5.999). Bold values indicate concentrations above MDL.

- All results in mg/kg.

- D = Sample diluted.

- U = Not detected above the Contact Required Quantitation Limit (CRQL).

- J = Estimated value, below the CRQL.

TABLE 5-13
Matteo Iron Metal
Test Pit Soil Sample Results - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION	TP45	TP45	TP47	TP48	TP49	TP50	TP53	TP55	TP56	TP-60	TP-61	TP-61	TP-64
SAMPLE ID	TP-45A	TP-45B	TP-47	TP-48A	TP-49	TP-50A	TP-53	TP-55	TP-56A	TP-60A	TP-61A	TP-61B	TP-64B
LAB ID	E76839-13	E76839-14	E76949-5	E76949-6	E76949-8	E76949-9	E77159-5	E77159-7	E77159-8	N1241-1	N1241-2	N1241-3	N1312-1
DATE	9/14/2000	9/14/2000	9/15/2000	9/15/2000	9/15/2000	9/15/2000	9/18/2000	9/18/2000	9/18/2000	10/22/2001	10/22/2001	10/22/2001	10/23/2001
SAMPLE INTERVAL (BGS)	1.5-2	2-3	12.5-13	1-1.5	1-1.5	1-1.5	12.5-13	7.5-8	2-2.5	1.5-2	1-1.5	6-6.5	9-10
ANALYTE	NJDEP												
Residential	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q D	Result Q D	Result Q D	Result Q D
Volatile Organic Compounds													
Benzene	13	0.58 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U 1
Chloroform	28	1.3 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U 1
cis-1,2-Dichloroethene	1,000	4.6 U	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U 1
Ethylbenzene	1,000	3.7 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U 1
Vinyl chloride	7	4.6 U	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U 1
Xylene (total)	1,000	32	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.011 U 1
Semi-Volatile Organic Compounds													
2,4-Dimethylphenol	10,000	35 D	0.34 U	0.41 U	0.37 U	0.39 U	0.44 U	0.35 U	0.34 U	0.35 U 1	0.34 U 1	0.35 U 1	0.38 U 1
Benzo(a)anthracene	4	1.8 U	0.34 U	0.41 U	0.046 J	0.036 J	0.022 J	0.44 U	0.35 U	0.34 U	0.35 U 1	0.35 U 1	0.38 U 1
Benzo(a)pyrene	0.66	1.8 U	0.34 U	0.41 U	0.046 J	0.036 J	0.026 J	0.44 U	0.35 U	0.34 U	0.35 U 1	0.35 U 1	0.38 U 1
Benzo(b)fluoranthene	4	1.8 U	0.34 U	0.41 U	0.046 J	0.036 J	0.029 J	0.44 U	0.35 U	0.34 U	0.35 U 1	0.35 U 1	0.38 U 1
Benzo(k)fluoranthene	4	1.8 U	0.34 U	0.41 U	0.039 J	0.031 J	0.021 J	0.44 U	0.35 U	0.34 U	0.35 U 1	0.35 U 1	0.38 U 1
bis(2-Ethylhexyl)phthalate	210	1.8 U	0.34 U	0.41 U	0.37 U	0.036 J	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U 1	0.052 J 1	0.047 J 1
Dibenz(a,h)anthracene	0.66	1.8 U	0.34 U	0.41 U	0.37 U	0.39 U	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U 1	0.35 U 1	0.38 U 1
Indeno(1,2,3-cd)pyrene	4	1.8 U	0.34 U	0.41 U	0.026 J	0.025 J	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U 1	0.35 U 1	0.38 U 1
Pesticide & PCB													
Dieldrin	0.18	0.018 U	0.0036 U	0.0041 U	0.0038 U	0.0037 U	0.0035 U	0.0045 U	0.0035 U	0.0033 U	0.0035 U 1	0.0034 U 1	0.0034 U 1
Aroclor 1248	2	0.86	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U 1	0.034 U 1	0.04 U 1
Aroclor 1254	2	0.18 U	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U 1	0.034 U 1	0.04 U 1
Aroclor 1260	2	0.18 U	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U 1	0.034 U 1	0.04 U 1
Total PCBs	2	0.86	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U 1	0.034 U 1	0.04 U 1
Metals													
Aluminum	NC	2,600	1,840	7,040	1,970	1,910	2,350	13,600	1,860	1,760	3,990 1	1,210 1	2,170 1
Antimony	340	108	2.6 J	0.39 U	1.6 J	1.9 J	1.1 J	0.46 UN	0.79 J	0.34 U	0.45 U 1	0.44 U 1	0.5 U 1
Arsenic	20	5.3	J	22.3 J	2.2 J	J	2.1	5.2 J	3.2	3.9	7.4 J	2.5 J	3.3 J
Barium	47,000	43	6.4 J	25.6 J	18.9 J	18 J	16.7 J	27 J	9.1 J	6.8 J	6.6 J 1	8.9 J 1	4.9 J 1
Beryllium	2	0.18 J	0.25 J	0.92 J	0.16 J	0.13 J	0.15 J	1.4 J	0.13 J	0.12 J	0.17 J 1	0.1 J 1	0.17 J 1
Cadmium	100	0.98 J	0.06 U	0.07 U	0.07 U	0.13 J	0.06 J	0.08 U	0.06 J	0.06 U	0.06 U 1	0.06 U 1	0.07 U 1
Copper	600	16.5	2.6 J	2.8 J	6.1	14.5	6.9	5.9 J	2.2 J	0.88 J	2.4 J 1	2.6 J 1	15.8 J
Iron	NC	16,200	9,450	71,300	4,440	8,120	4,570	34,000	6,450	6,680	13,100 1	4,080 1	10,800 1
Lead	600	16,200	9,450	71,300	4,440	8,120	4,570	34,000	6,450	6,680	13,100 1	4,080 1	10,800 1
Manganese	NC	249	45.2	181	77	74.2	50.6	86.5	26.9	11.8	32.7 J	10.6 J	87.9 J
Mercury	270	0.06 J	0.04 U	0.06 U	0.04 U	0.05 U	0.04 U	0.06 U	0.04 U	0.04 U	0.04 J 1	0.04 J 1	0.03 U 1
Nickel	2,400	64.6	5.9 J	16.5	3.3 J	5.2 J	4 J	15.5	3.2 J	1.6 J	1.9 J 1	2.2 J 1	1.6 J 1
Silver	4,100	0.17 J	0.15 U	0.16 U	0.15 U	0.15 U	0.14 U	0.19 U	0.14 U	0.14 U	0.15 U 1	0.15 U 1	0.17 U 1
Sodium	NC	96.3 J	25.7 J	19.7 U	19.4 J	18.7 U	16.9 U	59.5 J	27.1 J	32.5 J	89.7 J 1	75.8 J 1	40.5 J 1
Thallium	2	0.76 U	0.75 U	0.82 U	0.79 U	0.78 U	0.71 U	0.98 U	0.73 U	0.72 U	NA 1	NA 1	NA J 1
Zinc	1,500	1,570	14.5	44.8	32.4	42.1	34.5	68.2	59.5	6.5	13.3 J	27.7 J	11.3 J
Soil Characteristics													
Ph	NC	6	5.1	5.4	5.7	6.6	5.7	4.3	7.2	7.2	6.95 1	5.71 1	4.39 1
Cyanide	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U 1	0.05 U 1	0.06 U 1

Notes: - NJDEP NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99). Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - D = Sample diluted.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-13
Matteo Iron Metal
Test Pit Soil Sample Results - Non-Residential Criteria (NRSCC)

SAMPLE LOCATION		TP-67	TP-67	TP-70	TP-72	TP-74	TP-78	TP-78	TP-79	TP-81	TP-81	TP-81	TP-84	TP-86	TP-87	TP-88
SAMPLE ID		TP-67A	DUP-A	TP-70A	TP-72A	TP-74A	TP-78A	TP-78B	TP-79A	TP-81A	TP-81B	TP-81C	TP-84A	TP-86A	TP-87A	TP-88A
LAB ID		N1312-4	N1312-6	N1315-12	N1315-14	N1315-16	N1409-9	N1409-10	N1409-11	N1409-12	N1409-13	N1409-14	N1409-15	N1529-5	N1529-6	N1529-7
DATE		10/23/2001	10/23/2001	10/24/2001	10/24/2001	10/24/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/26/2001	10/26/2001	10/26/2001
SAMPLE INTERVAL (BGS)		3-3.5	3-3.5	4-5.5	4-4.5	7-7.5	8-8.5	5-5.5	7-7.5	3-3.5	3.5-4	7-7.5	5-5.5	4-5.5	4-5.5	2-5.5
ANALYTE		NIDEF Non Residential														
Volatile Organic Compounds		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Benzene	13	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
Chloroform	28	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
cis-1,2-Dichloroethene	1,000	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
Ethylbenzene	1,000	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
Vinyl chloride	7	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
Xylene (total)	1,000	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
Semi-Volatile Organic Compounds		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
2,4-Dimethylphenol	10,000	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Benzo(a)anthracene	4	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Benzo(a)pyrene	0.66	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Benzo(b)fluoranthene	4	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Benzo(k)fluoranthene	4	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
bis(2-Ethylhexyl)phthalate	210	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Dibenzo(a,h)anthracene	0.66	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Indeno(1,2,3-cd)pyrene	4	0.33	U	1	0.33	U	1	0.37	U	1	0.38	U	1	0.39	U	1
Pesticide & PCB		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Dieldrin	0.18	0.0037	U	1	0.0035	U	1	0.0037	U	1	0.0034	U	1	0.0036	U	1
Aroclor 1248	2	0.037	U	1	0.035	U	1	0.037	U	1	0.034	U	1	0.036	U	1
Aroclor 1254	2	0.037	U	1	0.035	U	1	0.037	U	1	0.034	U	1	0.036	U	1
Aroclor 1260	2	0.037	U	1	0.035	U	1	0.037	U	1	0.034	U	1	0.036	U	1
Total PCBs	2	0.037	U	1	0.035	U	1	0.037	U	1	0.034	U	1	0.036	U	1
Metals		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Aluminum	NC	3,870			2,280			2,120			1,380			5,670		
Antimony	340	0.88	J	1	2.7	J	1	0.45	U	1	1	J	1	79.8		
Arsenic	20	6.1			3.1			5.8			1.4	J	1	6.5		
Barium	47,000	15.3	J	1	15.7	J	1	3.6	J	1	5.3	J	1	10.6	J	1
Beryllium	2	0.28	J	1	0.13	J	1	0.21	J	1	0.14	J	1	0.17	J	1
Cadmium	100	0.06	U	1	0.06	U	1	0.06	U	1	0.07	U	1	0.07	U	1
Copper	600	5.8			6.9			1.7	J	1	1	J	1	12.9		
Iron	NC	13,000			6,150			9,730			2,500			12,500		
Lead	600	122			296			2.6			1.7			73.4		
Manganese	NC	69.6			53.1			16.3			9.7			24.1		
Mercury	270	0.05	J	1	0.07	J	1	0.04	J	1	0.03	J	1	0.05	J	1
Nickel	2,400	3.9	J	1	2.3	J	1	1.3	J	1	1.7	J	1	6.9	J	1
Silver	4,100	0.16	J	1	0.15	U	1	0.15	U	1	0.16	U	1	0.16	U	1
Sodium	NC	39.2	J	1	41.4	J	1	72.4	J	1	120	J	1	80.3	J	1
Thallium	2	NA			NA			NA			NA			NA		
Zinc	1,500	18.6			20			7.1			8.4			44.3		
Soil Characteristics		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
pH	NC	7.59			7.46			7.07			7.34			4.88		
Cyanide	NC	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1

Notes: - NIDEF NRSCC = New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D §999) compounds not listed did not meet or exceed soil cleanup criteria in any sample
 - Shaded values meet or exceed New Jersey Non-Residential Soil Cleanup Criteria (N.J.A.C. 7:26D §999). Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - D = Sample diluted.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-14
Matteo Iron Metal
Test Pit Soil Sample Results - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION		TP2A	TP6A	TP6A	TP6B	TP6B	TP7A	TP18	TP25	TP28	TP29	TP32	TP35	TP35	TP44
SAMPLE ID		TP-2A	TP-6A	TPDUP1	TP-6C	TP6D	TP-7B	TP-18	TP-25	TP-28C	TP-29	TP-32	TP-35	TP-11/P4	TP-44
LAB ID		E76419-11	E76419-6	E76419-10	E76419-5	E76419-14	E76419-4	E76651-1	E76651-8	E76651-14	E76651-15	E76651-18	E76651-20	E76839-1	E76839-12
DATE		9/7/2000	9/8/2000	9/8/2000	9/8/2000	9/15/2000	9/8/2000	9/12/2000	9/12/2000	9/13/2000	9/13/2000	9/13/2000	9/13/2000	9/14/2000	9/14/2000
SAMPLE INTERVAL (BGS)		3-3.5	6-6.5	6-6.5	2-2.5	1-1.5	1.5-2	8-8.5	2-2.5	0-0.5	9.5-10	1.5-2	5-5.5	5-5.5	2-2.5
ANALYTE	NJDEP IGW	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Volatiles Organic Compounds															
Benzene	1	0.029 U	0.015	0.003 J	0.022	0.008 U	0.01 U	0.011 U	0.005 J	0.011 U	NT	0.033 U	0.025 U	0.012 U	0.012 U
Chloroform	1	0.029 U	0.009 U	0.008 U	0.011 U	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U	0.012 U
cis-1,2-Dichlorobenzene	1	0.029 U	0.009 U	0.008 U	0.011 U	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U	0.012 U
Ethylbenzene	100	0.029 U	0.009 U	0.008 U	0.12 DJ	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U	0.012 U
Vinyl chloride	10	0.029 U	0.009 U	0.008 U	0.011 U	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U	0.012 U
Xylene (total)	67	0.029 U	0.009 U	0.008 U	0.27 DJ	30 U	0.008 U	0.01 U	0.011 U	0.036 U	0.011 U	NT	0.033 U	0.025 U	0.012 U
Semi-Volatile Organic Compounds															
2,4-Dimethylphenol	10	0.71 U	0.37 U	0.36 U	0.04 U	NT	0.38 U	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.68 U	0.68 U	0.42 U
Benzofuran	500	0.1 J	0.37 U	0.36 U	0.23 J	NT	0.038 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.34 J	0.1 J	0.04 J
Benzofuran	100	0.71 U	0.37 U	0.36 U	0.073 J	NT	0.039 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.33 J	0.11 J	0.045 J
Benzofuran	30	0.71 U	0.37 U	0.36 U	0.099 J	NT	0.042 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.29 J	0.1 J	0.04 J
Benzofuran	500	0.71 U	0.37 U	0.36 U	0.068 J	NT	0.032 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.24 J	0.094 J	0.068 J
bis(2-Ethylhexyl)phthalate	100	1.1	0.048 J	0.047 J	1.3	NT	0.043 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.051 J	0.044 J	0.012 U
Dibenzofuran	100	0.71 U	0.37 U	0.36 U	0.4 U	NT	0.38 U	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.073 J	0.068 U	0.021 U
Indeno(1,2,3-cd)pyrene	500	0.71 U	0.37 U	0.36 U	0.049 J	NT	0.037 J	0.39 U	0.4 U	2.5 U	0.4 U	0.35 U	0.16 J	0.06 J	0.047 J
Pesticide & PCB															
Dieldrin	30	0.35 D	0.0038 U	0.0036 U	0.0039 U	NT	0.0038 U	0.0039 U	0.0041 U	0.0025 U	0.0043 U	0.0036 U	0.0071 U	0.0066 U	0.0041 U
Aroclor 1248	50	0.069 U	0.038 U	0.036 U	0.039 U	NT	0.038 U	0.039 U	0.041 U	0.25 U	0.043 U	0.036 U	0.073 U	0.066 U	0.043 U
Aroclor 1254	50	0.069 U	0.038 U	0.036 U	0.53	NT	0.24	0.039 U	0.041 U	0.25 U	0.043 U	0.25	11 U	26	0.043 U
Aroclor 1260	50	0.069 U	0.038 U	0.036 U	0.039 U	NT	0.038	0.039 U	0.041 U	0.25 U	0.043 U	0.036 U	5.1 U	22	0.043 U
Total PCBs	50	0.069 U	0.038 U	0.036 U	0.53	NT	0.24	0.039 U	0.041 U	0.25 U	0.043 U	0.25	16.1 U	48	0.043 U
Metals															
Aluminum	(h)	7,950	1,800	1,930	8,980	1,980	2,940	2,790	1,470	10,500	1,270	3,500	19,200	14,600	13,800
Antimony	(h)	17.7 J	7.8 J	5.5 J	20.7	21.4	4.7 J	0.39 U	0.42 U	2.8 J	0.43 U	208	62.9	20.2 J	0.54 J
Arsenic	(h)	9.7	5.4	5	3.9	0.62 U	5.7	0.53 U	5.7	21.4	4.3	14.8	26.4	21.3	17.5
Barium	(h)	496	12.4 J	33.4 J	11.6 J	15.3 J	36.1 J	17.8 J	3.7 J	25 J	3.6 J	30.5 J	179	138	107
Beryllium	(h)	0.14 J	0.16 J	0.17 J	0.11 J	0.07 J	0.25 J	0.22 J	0.24 J	0.96 J	0.19 J	0.35 J	2.2	1.5 J	1.1
Cadmium	(h)	5.3	0.06 U	0.06 U	0.51 J	1.5 J	0.07 U	0.45 J	0.07 U	1.6	0.08 U	0.36 J	4.9	4.8	3.9
Copper	(h)	279	5.8	4.8 J	327	110	14.3	108	0.88 J	38.7	0.81 J	7.4	132	187	95.7
Iron	(h)	101,000	8,780	8,530	6,880	2,010	11,400	3,060	13,800	3,220	7,350	14,100	40,200	41,700	24,100
Lead	(h)	2,090	12.4	10.6	91.8	89.8	881	87.5	2.3	41.4	2.7	20.4	11,500	4,030	218
Manganese	(h)	256	11.9	20.8	120	1,350	40.8	15.2	10	33	6.6	56.3	679	756	240
Mercury	(h)	0.57	0.05 J	0.06 J	0.41	0.06 U	0.15	0.05 U	0.05 U	0.14	0.05 U	0.06 J	1.3	1.2	0.76
Nickel	(h)	68.7	12.5	11.6	185	234	4.3 J	4 J	1.2 J	5.8 J	0.88 J	8.4 J	47.2	38.2	25.6
Silver	(h)	32.7	0.15 U	0.15 U	0.32 J	0.19 U	0.15 U	0.16	0.17 U	0.2 U	0.18 U	0.15 U	19	143	1.1 J
Sodium	(h)	70.8 J	18.3 U	18.4 U	23.5 J	936 J	23.2 J	32.3 J	38.8 J	90.1 J	36 J	36.1 J	195 J	174 J	171 J
Thallium	(h)	1.5 U	0.76 U	0.77 U	0.82 U	3.9 U	0.78 U	0.83 U	0.89 U	1 U	0.92 U	0.77 U	1.5 U	1.4 U	0.9 U
Zinc	(h)	1610	21.9	20.9	472	31.4	47.4	84.7	5.9	367	6	40	694	516	584
Soil Characteristics															
pH	NC	5	3.4	4.7	5.9	6.6	6.7	7.4	6.6	6.6	6.7	6.7	5.6	5.3	5
Cyanide	NC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: - NJDEP IGW = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99). Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - D = Sample diluted.
 - U = Not detected above the Corrected Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-14
 Maize Iron Metal
 Test Pit Soil Sample Results - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION	TP45	TP45	TP47	TP48	TP49	TP50	TP53	TP55	TP56	TP-60	TP-61	TP-64
SAMPLE ID	TP-45A	TP-45B	TP-47	TP-48A	TP-49	TP-50A	TP-53	TP-55	TP-56A	TP-60A	TP-61A	TP-64A
LAB ID	E76839-13	E76949-14	E76949-5	E76949-6	E76949-8	E76949-9	E77159-5	E77159-7	E77159-8	N1241-1	N1241-2	N1241-3
DATE	9/14/2000	9/14/2000	9/15/2000	9/15/2000	9/15/2000	9/15/2000	9/18/2000	9/18/2000	9/18/2000	10/22/2001	10/22/2001	10/22/2001
SAMPLE INTERVAL (BGS)	1-5-2	2-2-5	12-5-13	1-1-5	1-1-5	1-1-5	12-5-13	7-5-8	2-2-5	1-5-2	1-1-5	6-6-5
ANALYTE	NJDEP Impact to GW											
Volatiles Organic Compounds	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q D	Result Q D	Result Q D
Benzene	0.58 J	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.01 U
Chloroform	1	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.01 U
cis-1,2-Dichloroethene	1	0.01 U	0.012 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.01 U
Ethylbenzene	100	3.7 J	0.01 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.01 U
Vinyl chloride	10	4.6 U	0.01 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.01 U
Xylene (total)	67	32	0.01 U	0.012 U	0.013 U	0.011 U	0.012 U	0.01 U	0.011 U	NA	NA	0.01 U
Semi-Volatiles Organic Compounds	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q D	Result Q D	Result Q D
2,4-Dimethylphenol	10	35 D	0.34 U	0.41 U	0.37 U	0.39 U	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Benzo(a)anthracene	500	1.8 U	0.34 U	0.41 U	0.046 J	0.036 J	0.022 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Benzo(a)pyrene	100	1.8 U	0.34 U	0.41 U	0.046 J	0.036 J	0.022 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Benzo(b)fluoranthene	50	1.8 U	0.34 U	0.41 U	0.046 J	0.036 J	0.022 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Benzo(k)fluoranthene	500	1.8 U	0.34 U	0.41 U	0.039 J	0.031 J	0.021 J	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
bis(2-Ethylhexyl)phthalate	100	1.8 U	0.34 U	0.41 U	0.37 U	0.036 J	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Dibenzo(a,h)anthracene	100	1.8 U	0.34 U	0.41 U	0.37 U	0.036 J	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Indeno(1,2,3-cd)pyrene	500	1.8 U	0.34 U	0.41 U	0.026 J	0.025 J	0.36 U	0.44 U	0.35 U	0.34 U	0.35 U	0.34 U
Pesticide & PCB	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q D	Result Q D	Result Q D
Dieldrin	50	0.018 U	0.0036 U	0.0041 U	0.0038 U	0.0037 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U	0.0035 U
Aroclor 1248	50	0.86	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U	0.034 U
Aroclor 1254	50	0.18 U	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U	0.034 U
Aroclor 1260	50	0.18 U	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U	0.034 U
Total PCBs	50	0.86	0.036 U	0.041 U	0.038 U	0.037 U	0.035 U	0.045 U	0.035 U	0.033 U	0.035 U	0.034 U
Metals	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q D	Result Q D	Result Q D
Aluminum	(h)	2,600	1,840	7,040	1,970	1,910	2,350	13,600	1,860	1,760	3,990	1,210
Antimony	(h)	108	2.6 J	0.39 U	1.6 J	1.9 J	1.1 J	0.46 U	0.79 J	0.34 U	0.45 U	0.44 U
Arsenic	(h)	5.3	3	22.2	2.2 J	3	2.1	24.1	3.2	3.9	7.4	2.5
Barium	(h)	43	6.4 J	25.6 J	18.9 J	18.9 J	16.7 J	27 J	9.1 J	6.8 J	8.9 J	8 J
Beryllium	(h)	0.18 J	0.25 J	0.92 J	0.16 J	0.13 J	0.15 J	1.4 J	0.13 J	0.12 J	0.17 J	0.12 J
Cadmium	(h)	0.98 J	0.06 U	0.07 U	0.07 U	0.13 J	0.06 J	0.08 U	0.06 J	0.06 U	0.06 U	0.07 U
Copper	(h)	16.5	2.6 J	2.8 J	6.1	14.5	6.9	5.9 J	2.2 J	0.88 J	2.4 J	2.6 J
Iron	(h)	16,200	9,450	71,300	4,440	8,120	4,570	34,000	6,450	6,600	13,100	4,080
Lead	(h)	24,300	9.1	8.6	57.9	108	104	10.2	19.5	2	4.8	2
Manganese	(h)	249	45.2	181	77	74.2	50.6	86.5	26.9	11.8	32.7	10.6
Mercury	(h)	0.06 J	0.04 U	0.06 U	0.04 U	0.05 U	0.04 U	0.06 U	0.04 U	0.04 U	0.04 J	0.04 J
Nickel	(h)	64.6	5.9 J	16.5	3.3 J	5.2 J	4 J	15.5	3.2 J	1.6 J	1.9 J	2.2 J
Silver	(h)	0.17 J	0.15 U	0.16 U	0.15 U	0.15 U	0.14 U	0.19 U	0.14 U	0.14 U	0.15 U	0.15 U
Sodium	(h)	96.3 J	25.7 J	19.7 U	19.4 J	18.7 U	16.9 U	59.5 J	27.1 J	32.5 J	89.7 J	75.8 J
Thallium	(h)	0.76 U	0.75 U	0.82 U	0.79 U	0.78 U	0.71 U	0.98 U	0.73 U	0.72 U	NA	NA
Zinc	(h)	1,570	14.5	44.8	32.4	42.1	34.5	68.2	59.5	6.5	13.3	27.7
Soil Characteristics	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q D	Result Q D	Result Q D
pH	6	5.1	5.4	5.7	6.6	5.7	4.3	7.2	7.2	6.95	5.71	7.27
Cyanide	NC	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	0.05 U	0.05 U

Notes: - NJDEP SCC = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5/99). Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - D = Sample diluted.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-14
Matteo Iron Metal
Test Pit Soil Sample Results - Impact to Groundwater Criteria (IGW)

SAMPLE LOCATION	TP-67	TP-67	TP-70	TP-72	TP-74	TP-78	TP-78	TP-79	TP-81	TP-81	TP-81	TP-84	TP-86	TP-87	TP-88	
SAMPLE ID	TP-67A	DUP-A	TP-70A	TP-72A	TP-74A	TP-78A	TP-78B	TP-79A	TP-81A	TP-81B	TP-81C	TP-84A	TP-86A	TP-87A	TP-88A	
LAB ID	N1312-4	N1312-6	N1315-12	N1315-14	N1315-16	N1409-9	N1409-10	N1409-11	N1409-12	N1409-13	N1409-14	N1409-15	N1529-5	N1529-6	N1529-7	
DATE	10/23/2001	10/23/2001	10/24/2001	10/24/2001	10/24/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/25/2001	10/26/2001	10/26/2001	10/26/2001	
SAMPLE INTERVAL (BGS)	3-5	3-5	4-5	4-5	7-7.5	8-8.5	5-5.5	7-7.5	3-3.5	3-3.5	7-7.5	5-5.5	4-5-5	4-5-5	2-5-3	
ANALYTE	NJDEP	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Volatiles Organic Compounds																
Benzene	Impact to GW	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chloroform		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
cis-1,2-Dichloroethene		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Ethylbenzene	100	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Vinyl chloride	10	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Xylene (total)	67	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Semi-Volatile Organic Compounds																
2,4-Dimethylphenol	10	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Benzo(a)anthracene	500	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Benzo(a)pyrene	100	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Benzo(b)fluoranthene	50	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Benzo(k)fluoranthene	500	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
bis(2-Ethylhexyl)phthalate	100	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Dibenz(a,h)anthracene	100	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Indeno(1,2,3-cd)pyrene	500	0.33 U	0.33 U	0.37 U	0.37 U	0.37 U	0.37 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
Pesticide & PCB																
Dieldrin	50	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U	0.0037 U
Aroclor 1248	50	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
Aroclor 1254	50	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
Aroclor 1260	50	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
Total PCBs	50	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U	0.037 U
Metals																
Aluminum	(h)	3,870	3,870	2,120	1,380	5,670	1,950	2,340	2,650	2,250	2,860	2,690	2,330	13,190	1,670	3,110
Antimony	(h)	0.88 J	2.7 J	0.45 U	1 J	79.8 J	4.3 J	2 J	5.9 J	1.4 J	1.1 J	0.72 J	4.6 J	0.55 U	0.56 U	0.56 U
Arsenic	(h)	6.1 J	3.1 J	5.8 J	1.4 J	6.5 J	7.5 J	5.6 J	8.4 J	2.1 J	5.7 J	7.6 J	5.4 J	7.1 J	6.9 J	6.3 J
Barium	(h)	15.3 J	15.7 J	3.6 J	5.3 J	10.6 J	4.9 J	19.5 J	11 J	32.5 J	10 J	7.8 J	9 J	13.1 J	6.8 J	5.3 J
Beryllium	(h)	0.38 J	0.13 J	0.21 J	0.14 J	0.17 J	0.21 J	0.16 J	0.24 J	0.06 J	0.24 J	0.24 J	0.19 J	0.27 J	0.2 J	0.24 J
Cadmium	(h)	0.06 U	0.06 U	0.06 U	0.07 U	0.07 U	0.07 U	0.06 J	0.1 J	1.1 J	0.06 U	0.08 U	0.08 U	0.17 J	0.18 J	0.19 J
Copper	(h)	5.8 J	6.9 J	1.7 J	1 J	12.9 J	4.3 J	5.8 J	4.5 J	12.2 J	2.1 J	2.8 J	2 J	2.5 J	2.1 J	2.3 J
Iron	(h)	13,000	6,150	9,730	2,500	12,500	12,400	5,590	8,950	6,630	10,100	11,300	7,370	11,400	10,600	12,700
Lead	(h)	122	296	2.6	1.7	73.4	5.1	25.8	6.5	520	4.1	2.4	3.1	2.8	2.3	2.4
Manganese	(h)	69.6 J	53.1 J	16.3 J	9.7 J	24.1 J	26.2 J	85.6 J	11.1 J	32.3 J	19.8 J	18.2 J	7.2 J	39.1 J	19.9 J	14.5 J
Mercury	(h)	0.05 J	0.07 J	0.04 J	0.03 J	0.05 J	0.11 J	0.04 J	0.03 U	0.06 J	0.03 U	0.03 U	0.04 U	0.03 U	0.03 U	0.03 U
Nickel	(h)	3.9 J	2.3 J	1.3 J	1.7 J	6.9 J	2.2 J	2 J	3.2 J	5.1 J	3.3 J	3.4 J	1.8 J	1.9 J	0.99 J	1.1 J
Silver	(h)	0.16 J	0.15 U	0.15 U	0.16 U	0.16 U	0.52 J	0.15 U	0.15 U	0.17 U	0.15 U	0.18 U	0.18 U	0.19 U	0.18 U	0.19 U
Sodium	(h)	39.2 J	41.4 J	72.4 J	120 J	80.3 J	87.4 J	78.3 J	86.4 J	105 J	94.7 J	115 J	82 J	137 J	137 J	149 J
Thallium	(h)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	(h)	18.6 J	20 J	7.1 J	8.4 J	44.3 J	25 J	21.7 J	72.3 J	259 J	22.8 J	13.4 J	179 J	14.8 J	9.9 J	10.9 J
Soil Characteristics																
Ph	NC	7.59	7.46	7.07	7.34	4.88	5.15	6.25	6.43	5.61	6.36	6.48	5.7	4.89	6.76	6.85
Cyanide	NC	0.05 U	0.05 U	0.05 U	0.06 U	0.05 U	0.05 U	0.05 U	0.06 U	0.05 U	0.05 U	0.06 U	0.06 U	0.06 U	0.05 U	0.05 U

Notes: - NJDEP SCC = New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5.999) compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (N.J.A.C. 7:26D 5.999). Bold values indicate concentrations above MDL.
 - All results in mg/kg.
 - D = Sample diluted.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-15
Matteo Iron and Metal
SURFACE SOIL SAMPLE RESULTS (TCL/ATL/pH)

LOCATION	FULL-1	FULL-2	FULL-3	FULL-3	FULL-4	FULL-5	TPSS-D1	TPSS-E1	TPSS-I1	TPSS-I1	TPSS-J1	TPSS-K1	TPSS-L1	TPSS-M1		
SAMPLE ID	FULL-1	FULL-2	FULL-3	FULL-DUP	FULL-4	FULL-5	TPSS-D1	TPSS-E1	TPSS-I1	TPSS-DUP	TPSS-J1	TPSS-K1	TPSS-L1	TPSS-M1		
LAB ID	E81503-2	E81503-3	E81503-4	E81503-7	E81503-5	E81503-6	E77159-10	E77159-11	E78373-1	E78373-6	E78373-2	E78373-3	E78373-4	E78373-5		
DATE	11/28/2000	11/28/2000	11/28/2000	11/28/2000	11/28/2000	11/28/2000	9/19/2000	9/19/2000	10/6/2000	10/6/2000	10/6/2000	10/6/2000	10/6/2000	10/6/2000		
SAMPLE INTERVAL (BGS)	0.5-0.8	0.5-0.8	1	1	0.5-1	0.5-1	0-0.5	0-0.5	0.5-0.8	0.5-0.8	0.5-0.8	0.5-0.8	0.5-0.8	0.5-0.8		
ANALYTE	RSCC*	NRSCC*														
Volatile Organic Compounds																
Benzene	3	13	0.009 U	0.01 U	0.009 U	0.009 U	0.015 U	0.012 U	0.013 U	0.017 U	0.011 U	0.01 U	0.01 U	0.01 U	0.016 U	0.011 U
Chloroform	19	28	0.009 U	0.01 U	0.009 U	0.009 U	0.015 U	0.012 U	0.013 U	0.017 U	0.011 U	0.01 U	0.01 U	0.01 U	0.016 U	0.011 U
cis-1,2-Dichloroethene	79	1,000	0.009 U	0.01 U	0.009 U	0.009 U	0.015 U	0.012 U	0.013 U	0.017 U	0.011 U	0.01 U	0.01 U	0.01 U	0.016 U	0.011 U
Ethylbenzene	1,000	1,000	0.009 U	0.01 U	0.009 U	0.009 U	0.015 U	0.012 U	0.013 U	0.017 U	0.011 U	0.01 U	0.01 U	0.01 U	0.016 U	0.011 U
Vinyl chloride	2	7	0.009 U	0.01 U	0.009 U	0.009 U	0.015 U	0.012 U	0.013 U	0.017 U	0.011 U	0.01 U	0.01 U	0.01 U	0.016 U	0.011 U
Xylene (total)	410	1,000	0.009 U	0.01 U	0.009 U	0.009 U	0.015 U	0.012 U	0.013 U	0.017 U	0.011 U	0.01 U	0.01 U	0.01 U	0.016 U	0.011 U
Semi-Volatile Organic Compounds																
2,4-Dimethylphenol	1,100	10,000	0.42 U	0.43 U	0.4 U	0.38 U	0.44 U	0.44 U	0.39 U	0.49 U	0.36 U	0.36 U	0.37 U	0.36 U	0.43 U	0.38 U
Benzo(a)anthracene	0.9	4	0.028 J	0.058 J	0.4 U	0.38 U	0.032 J	0.076 J	0.058 J	0.49 U	0.140 J	0.045 J	0.042 J	0.023 J	0.062 J	0.38 U
Benzo(a)pyrene	0.66	0.66	0.024 J	0.100 J	0.4 U	0.38 U	0.44 U	0.098 J	0.066 J	0.49 U	0.110 J	0.035 J	0.038 J	0.019 J	0.110 J	0.38 U
Benzo(b)fluoranthene	0.9	4	0.024 J	0.092 J	0.4 U	0.38 U	0.44 U	0.076 J	0.065 J	0.49 U	0.110 J	0.028 J	0.025 J	0.021 J	0.150 J	0.38 U
Benzo(k)fluoranthene	0.9	4	0.026 J	0.058 J	0.4 U	0.38 U	0.44 U	0.083 J	0.058 J	0.49 U	0.100 J	0.041 J	0.045 J	0.020 J	0.089 J	0.38 U
bis(2-Ethylhexyl)phthalate	49	210	0.42 U	0.062 J	0.4 U	0.38 U	0.44 U	0.44 U	0.39 U	0.046 J	0.36 U	0.36 U	0.37 U	0.36 U	0.920	0.38 U
Dibenz(a,h)anthracene	0.66	0.66	0.42 U	0.43 U	0.4 U	0.38 U	0.44 U	0.44 U	0.39 U	0.49 U	0.025 J	0.36 U	0.37 U	0.36 U	0.024 J	0.38 U
Indeno(1,2,3-cd)pyrene	0.9	4	0.42 U	0.056 J	0.4 U	0.38 U	0.44 U	0.048 J	0.039 J	0.49 U	0.058 J	0.023 J	0.023 J	0.36 U	0.055 J	0.38 U
Pesticide & PCB																
Dieldrin	0.042	0.18	0.0043 U	0.0043 U	0.004 U	0.0037 U	0.0045 U	0.0043 U	0.0039 U	0.0049 U	0.0036 U	0.0035 U	0.0037 U	0.0037 U	0.0042 U	0.0038 U
Aroclor 1248	0.49	2	0.043 U	0.043 U	0.04 U	0.037 U	0.045 U	0.043 U	0.039 U	0.049 U	0.036 U	0.035 U	0.037 U	0.037 U	0.042 U	0.038 U
Aroclor 1254	0.49	2	0.043 U	0.24	0.049	0.046	0.045 U	0.043 U	0.039 U	0.049 U	0.036 U	0.035 U	0.037 U	0.037 U	8	0.038 U
Aroclor 1260	0.49	2	0.043 U	0.29	0.05 J	0.04 J	0.045 U	0.043 U	0.039 U	0.049 U	0.036 U	0.035 U	0.037 U	0.037 U	7.2	0.038 U
Total Aroclor	0.49	2	0.043 U	0.53	0.10	0.086	0.045 U	0.043 U	0.039 U	0.049 U	0.036 U	0.035 U	0.037 U	0.037 U	15.2 N	0.038 U
Metals																
Aluminum	NC	NC	2,850	5,440	2,200	2,190	2,890	2,680	1,980	2,640	2,150	1,960	2,090	2,270	3,000	8,060
Antimony	14	340	3.1	2.1	0.2	0.1	0.1	9.1 J	1.1 J	10.3 J	1.9 J	2 J	1 J	0.37	12.3 J	0.58 J
Arsenic	20	20	4.4	11.4	3.2	1.7 J	4.2	4	4.1	3.9	16.5	15.9	4.7	4.8	7.2	15.2
Barium	700	47,000	21.8 J	69.4	9.3 J	10.6 J	9.5 J	35.9 J	33.1 J	35.2 J	20.1 J	22.6 J	30.8 J	26.2 J	232	16.9 J
Beryllium	2	2	0.18 J	0.22 J	0.15 J	0.11 J	0.11 J	0.17 J	0.13 J	0.15 J	0.12 J	0.13 J	0.22 J	0.16 J	0.32 J	0.42 J
Cadmium	39	100	0.19 J	0.61 J	0.09 J	0.09 J	0.22 J	0.21 J	0.16 J	0.11 J	0.32 J	0.32 J	0.09 J	0.12 J	0.87 J	0.07 U
Copper	600	600	6.6	15.8	2.4 J	2.3 J	5.6 J	13.2	10	13.2	50.8	51.4	6.2	5.5	14,350 N	13.2
Iron	NC	NC	6,470	9,680	6130	5,040	5,420	6,750	6,740	6,940	4,920	4,940	5,300	4,080	14,200	25,800
Lead	400	600	26.8	52.4	4.7	5.1	28.4	88.8	120	35.8	43.6	44.1	34.3	31.4	190	19.9
Manganese	NC	NC	147	277	14.7	14.6	34.7	57.7	108	221	58.9	60.1	88.9	99.8	696	51.3
Mercury	14	270	0.09	0.14	0.06 J	0.05 U	0.1 J	0.22	0.1	0.17	0.3	0.32	0.04 U	0.06 J	0.41	0.06 U
Nickel	250	2,400	3.8 J	4.6 J	2.00 J	1.9 J	1.9 J	5.4 J	4.3 J	7.4 J	1.5 J	1.5 J	2.2 J	2.5 J	10.4	6.8 J
Silver	110	4,100	0.15 U	0.16 U	0.14 U	0.14 U	0.17 U	0.17 U	0.16 U	0.28 J	0.14 U	0.14 U	0.15 U	0.15 U	1.8 J	0.16 U
Sodium	NC	NC	45.2 J	36.2	31 J	34.6 J	49.3 J	27.2 J	41.5 J	86.9 J	60.7 J	119 J	117 J	113 J	194 J	133 J
Thallium	2	2	0.77 U	0.84	0.7 U	0.73 U	0.87 U	0.88 U	0.83 U	1 U	0.72 U	0.74 U	0.79 U	0.76 U	0.9 U	0.8 U
Zinc	1,500	1,500	35.6	126	17.3	15.8	23.9	33.4	66.8	70.8	16.7	15.8	19.6	23.5	355	32.8
Soil Characteristics																
Ph			7	5.4	6.5	6.7	5.3	5.7	7.2	6.6	4.6	4.6	5.1	5.4	6.4	4.6

Notes: - * N.J. Residential Soil Cleanup Criteria (RSCC); Non-Residential Soil Cleanup Criteria (NRSCC). Compounds not listed did not meet or exceed soil cleanup criteria in any sample.
 - Shaded values meet or exceed N.J. Residential Direct Soil Criteria
 - Shaded values with "N" meet or exceed N.J. Non-Residential Soil Criteria.
 - All results in mg/kg.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.

TABLE 5-16
Matteo Iron Metal
Soil Characteristics Sample Results

Location ID		T-1			T-2			T-3			T-4			T-5		
Sample ID	TCLP Maximums	T-1			T-2			T-3			T-4			T-5		
Lab Sample ID	(RCRA Standards)	N12322-1			N12322-2			N12322-3			N12322-4			N12322-5		
Sampling Date		4/11/2002			4/11/2002			4/11/2002			4/11/2002			4/11/2002		
Depth (ft)		0-1			0-1			0-1			0-1			0-1		
Units		mg/l			mg/l			mg/l			mg/l			mg/l		
GC/MS Volatiles (SW846 8260B)		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Benzene	0.5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5
2-Butanone (MEK)	200	0.025	U	5	0.025	U	5	0.025	U	5	0.025	U	5	0.025	U	5
Carbon tetrachloride	0.5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5
Chlorobenzene	100	0.01	U	5	0.01	U	5	0.01	U	5	0.01	U	5	0.01	U	5
Chloroform	6	0.025	U	5	0.025	U	5	0.025	U	5	0.025	U	5	0.025	U	5
1,4-Dichlorobenzene	7.5	0.025	U	5	0.025	U	5	0.025	U	5	0.025	U	5	0.025	U	5
1,2-Dichloroethane	0.5	0.01	U	5	0.01	U	5	0.01	U	5	0.01	U	5	0.01	U	5
1,1-Dichloroethene	0.7	0.01	U	5	0.01	U	5	0.01	U	5	0.01	U	5	0.01	U	5
Tetrachloroethene	0.7	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5
Trichloroethene	0.5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5
Vinyl chloride	0.2	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5	0.005	U	5
GC/MS Semi-volatiles (SW846 8270C)		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
2-Methylphenol	200	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1
3&4-Methylphenol	200	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1
Pentachlorophenol	100	0.2	U	1	0.2	U	1	0.2	U	1	0.2	U	1	0.2	U	1
2,4,5-Trichlorophenol	400	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1
2,4,6-Trichlorophenol	2	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1
1,4-Dichlorobenzene	7.5	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1
2,4-Dinitrotoluene	0.13	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1
Hexachlorobenzene	0.13	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1
Hexachlorobutadiene	0.5	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1
Hexachloroethane	3	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1	0.05	U	1
Nitrobenzene	2	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1
Pyridine	5	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1	0.02	U	1
GC Semi-volatiles (SW846 8151)		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
2,4-D	10	0.005	U	1	0.005	U	1	0.005	U	1	0.005	U	1	0.005	U	1
2,4,5-TP (Silvex)	1	0.001	U	1	0.001	U	1	0.001	U	1	0.001	U	1	0.001	U	1
gamma-BHC (Lindane)	0.4	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1
Chlordane	0.03	0.005	U	1	0.005	U	1	0.005	U	1	0.005	U	1	0.005	U	1
Endrin	0.02	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1
Heptachlor	0.008	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1
Heptachlor epoxide	0.008	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1
Methoxychlor	10	0.0005	U	1	0.0005	U	1	0.0005	U	1	0.0005	U	1	0.0005	U	1
Toxaphene	0.5	0.0025	U	1	0.0025	U	1	0.0025	U	1	0.0025	U	1	0.0025	U	1
Metals Analysis		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Arsenic	5	0.5	U	1	0.5	U	1	0.5	U	1	0.5	U	1	0.5	U	1
Barium	100	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1
Cadmium	1	0.043	1		0.011	1		0.005	U	1	0.0058			0.005	U	1
Chromium	5	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
Lead	5	0.5	U	1	62	2		3.8	1		241			0.52	1	
Mercury		0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1	0.0002	U	1
Selenium		0.5	U	1	0.5	U	1	0.5	U	1	0.5	U	1	0.5	U	1
Silver	5	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1	0.01	U	1
General Chemistry		Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D	Result	Q	D
Units		mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Cyanide Reactivity	250	1.6	U	1	2	U	1	2.7	U	1	1.6	U	1	1.5	U	1
Sulfide Reactivity	500	50	U	1	50	U	1	50	U	1	50	U	1	50	U	1
Ignitability (Flashpoint) (Deg. F)	>140	200	>	1	200	>	1	200	>	1	200	>	1	200	>	1
Solids, Percent (%)	NC	90.6	1		75.1	1		54.8	1		94.8			97		
Corrosivity as pH ()	NC	7.62	NC	1	6.12	NC	1	6.67	NC	1	6.02	NC	1	6.77	NC	1

Notes:

- Shaded values meet or exceed RCRA Standards.

- Bold values indicate concentrations above MDL.

D = Dilution Factor

Q = Qualifier

U = Non Detect

TABLE 5-17
Matteo Iron and Metal
Hydraulic Conductivity Test Results

Well ID	Test Date	Localized Horizontal Permeability Value
MW-14D	11/2/2000	22.7 ft. / day
MW-16D	11/2/2000	6.4 ft. / day
MW-17D	11/2/2000	11.9 ft. / day
Average Horizontal Permeability = 13.6 ft. / day		

TABLE 5-18
 Matrix Iron and Metal
 Groundwater Monitoring Well Results: Round 1 - Unfiltered (December 4 to 8, 2000)

SAMPLE LOCATION		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12
SAMPLE ID		MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09	MW-10	MW-11	MW-12
LAB ID		E82056-33	E81966-10	E82056-27	E82056-30	E82056-28	E82056-17	E81966-8	E82056-16	E82056-5	E82056-4	E82056-3	E82056-6
DATE		12/8/2000	12/5/2000	12/8/2000	12/8/2000	12/8/2000	12/7/2000	12/5/2000	12/7/2000	12/6/2000	12/6/2000	12/6/2000	12/6/2000
ANALYTE	NJ GWQS*												
Volatiles Organic Compounds													
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylene (total)	40	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds													
2,4-Dimethylphenol	100	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	0.2	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	0.2	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	1	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	30	7	11 U	2 J	1 J	11 U	11 U	11 U	9 J	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	1	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U	10 U	10 U	10 U
Pesticide & PCB													
Dieldrin	0.03	0.11 U	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
Aroclor 1248	1	1.1 U	1.1 U	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Aroclor 1254	1	1.1 U	1.1 U	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Aroclor 1260	1	1.1 U	1.1 U	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Metals													
Aluminum	200	9,920	3,571	862	1,197	8,130	6,850	3,540	2,470	3,010	8,630	14,900	16,300
Antimony	20	2.4 U	1.7 U	2.4 U	2.4 U	58.1 J	2.4 U	1.7 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
Arsenic	8	7.4	2.3 U	4.3 U	4.3 U	12.2	11.8	8.4 J	4.3 U	7.5 J	12.4	20.3	55.9
Barium	2,000	34.2 J	19.7 J	40.5 J	46.4 J	82.5 J	53.3 J	23.5 J	61.8 J	44.5 J	10.6 J	73.7 J	44 J
Beryllium	20	0.51 J	0.2 U	0.4 U	0.4 U	1.1 J	0.78 J	0.37 J	0.74 J	0.68 J	0.46 J	0.92 J	1.3 J
Calcium	4	1.4 J	0.3 U	0.6 U	0.83 J	6.9	0.6 U	0.31 J	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Chromium	100	13.4	1 J	3.5 J	1.9 U	23.5	18.9	11.1	10	9.7 J	26.3	44.7	47.7
Copper	1,000	99.9	0.75 J	2.9 J	3 J	104	9.6 J	2.5 J	8.7 J	5.6 J	5.8 J	9.8 J	10.8 J
Iron	300	9,920	3,571	150	517	11,500	12,900	7,360	3,140	9,260	26,600	53,100	64,900
Lead	10	11.7	1.6 J	1.8 U	7.7	6,050	8.9	2 J	6.1	4.2	5.4	27.1	11.2
Manganese	50	17.2	14.2 J	41.1	43.1	197	62	29.9	138	23.7	24.4	68.1	67.8
Mercury	2	0.1 U	0.1 U	0.1 U	0.1 U	0.49	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	100	15.9 J	1.3 U	4.1 J	6.4 J	38.3 J	16.9 J	2.2 J	10.4 J	3.5 J	4.8 J	10.3 J	8.6 J
Silver	N/A	1 U	0.7 U	1 U	1 U	1 U	1 U	0.7 U	1 U	1 U	1 U	1 U	1 U
Sodium	50,000	10,800	1,370	2,070 J	4,170 J	12,400	23,400	2,150 J	6,810	15,900	14,900	18,200	18,800
Thallium	10	3.3 U	3.6 U	3.5 J	3.3 U	3.3 U	3.3 U	3.6 U	3.3 J	3.3 U	3.3 U	3.3 U	3.3 U
Zinc	5,000	331	18.8 J	33.7	204	1,540	140	18.8 J	66.7	33.2	29.5	60	50.5

Notes: - * GWQS = New Jersey Ground Water Quality Standards; Compounds not listed did not meet or exceed criteria in any sample.
 - Shaded values meet or exceed New Jersey Ground Water Quality Standards. Bold values indicated detections above MDL.
 - All results in ug/l.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value.

TABLE 5-18
Matteo Iron and Metal
Groundwater Monitoring Well Results: Round 1 - Unfiltered (December 4 to 8, 2000)

SAMPLE LOCATION		MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-13D	MW-14D	MW-15D	MW-16D	MW-17D	MW-18D
SAMPLE ID		MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-13D	MW-14D	MW-15D	MW-16D	MW-17D	MW-18D
LAB ID		E82056-19	E81966-2	E82056-14	E82056-32	E81966-4	E82056-1	E82056-18	E81966-1	E82056-15	E82056-31	E81966-5	E82056-2
DATE		12/6/2000	12/4/2000	12/7/2000	12/8/2000	12/5/2000	12/6/2000	12/6/2000	12/4/2000	12/7/2000	12/8/2000	12/5/2000	12/6/2000
ANALYTE		NJ GWQS*											
Volatile Organic Compounds													
Benzene	1		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6		10 U	10 U	10 U	10 U	10 U	10 U	1 J	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	17	10 U	10 U
Ethylbenzene	700		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	5		10 U	10 U	10 U	10 U	10 U	10 U	10 U	137	8 J	6 J	10 U
Xylene (total)	40		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds													
2,4-Dimethylphenol	100		11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U
Benzo(a)anthracene	0.2	11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U	10 U
Benzo(a)pyrene	0.2	11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U	10 U
Benzo(b)fluoranthene	10	11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U	10 U
Benzo(k)fluoranthene	1	11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U	10 U
bis(2-Ethylhexyl)phthalate	30	11 U	2 J	11 U	2 J	11 U	10 U	1 J	11 U	35	14	24	3 J
Dibenz(a,h)anthracene	1	11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U	10 U
Indeno(1,2,3-cd)pyrene	10	11 U	11 U	11 U	11 U	11 U	10 U	10 U	11 U	11 U	11 U	11 U	10 U
Pesticide & PCB													
Dieldrin	0.03	0.1 U	0.1 U	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.1 U
Aroclor 1248	1	1.0 U	1.0 U	1.0 U	1.1 U	1.1 U	1.0 U	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.0 U
Aroclor 1254	1	1.0 U	1.0 U	1.0 U	1.1 U	1.1 U	1.0 U	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.0 U
Aroclor 1260	1	1.0 U	1.0 U	1.0 U	1.1 U	1.1 U	1.0 U	1.0 U	1.1 U	1.1 U	1.1 U	1.1 U	1.0 U
Metals													
Aluminum	200	18,900	15,700	15,618	16,605	18,900	15,920	16,615	17,750	17,113	16,324	14,410	15,525
Antimony	20	2.4 U	1.7 U	2.4 U	2.4 U	1.7 U	4.9 J	2.4 U	1.7 U	2.4 U	2.4 U	1.7 U	2.4 U
Arsenic	8	18.7	6.7 J	4.3 U	4.3 U	14.7	27.4 J	58.3	24.8	36.8	6.5 J	2.5 J	4.3 U
Barium	2,000	70.4 J	61.7 J	48.3 J	402	49.3 J	20.4 J	39.7	133 J	38.2 J	39.4 J	16.4 J	11 J
Beryllium	20	1.4 J	0.23 J	0.43 J	0.4 U	1.1 J	0.46 J	0.4 U	0.2 U	0.4 U	0.4 U	0.2 U	0.4 U
Cadmium	4	0.4 J	0.3 U	0.6 U	0.6 U	0.33 J	0.6 U	0.6 U	0.3 J	0.6 U	0.6 U	0.1 U	0.6 U
Chromium	100	25.7	16.9	1.9 U	3.9 J	47.3	19.3	5.4 J	5.1 J	4.2 J	2.7 J	4.3 J	2.5 J
Copper	1,000	11.7 J	2.5 J	4.6 J	4.1 J	12 J	4 J	4.5 J	0.91 J	4.1 J	5.1 J	4.4 J	5.3 J
Iron	300	15,500	17,000	15,700	15,170	28,400	24,000	49,100	19,200	23,700	14,600	14,400	4,720
Lead	10	12.6 J	3.1	3.6	3.8	9.4 J	1.8 U	15.2	1.5 J	3.8	5.1	2.8 J	1.8 U
Manganese	50	153	140	171	149.1	172.7	161.9	172.7	173.6	185	196.5	18.5	75.4
Mercury	2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	100	35 J	11.2 J	5.6 J	2.1 U	14.7 J	7 J	4.3 J	1.7 J	3.2 J	2.1 U	2.4 J	4.4 J
Silver	N/A	1 U	0.7 U	1 U	1 U	0.7 U	1 U	1 U	0.7 U	1 U	1 U	0.7 U	1 U
Sodium	50,000	26,200	9,440	5,040	20,700	14,900	18,500	21,800	16,600	27,800	21,000	26,100	28,500
Thallium	10	3.3 U	3.6 U	3.3 U	3.3 U	3.6 U	3.3 U	3.3 U	3.6 U	3.3 U	5.2 J	3.6 U	3.3 U
Zinc	5,000	515	28.3	46.3	48.9	56.6	36.2	30.7	10.6 J	15.6 J	24.7	9.8 J	20.8

Notes: - * GWQS = New Jersey Ground Water Quality Standards: Compounds not listed did not meet or exceed criteria in any sample.
 - Shaded values meet or exceed New Jersey Ground Water Quality Standards. Bold values indicated detections above MDL.
 - All results in ug/l.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value.

TABLE 6-19
Matteo Iron and Metal
 Groundwater Monitoring Well Results: Round 1 - Filtered (December 4 to 8, 2000)

SAMPLE LOCATION		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12
SAMPLE ID		MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09	MW-10	MW-11	MW-12
LAB ID		E82056-41	E81966-17	E82056-36	E82056-38	E82056-37	E82056-24	E81966-16	E82056-23	E82056-12	E82056-11	E82056-10	E82056-13
DATE		12/8/2000	12/5/2000	12/8/2000	12/8/2000	12/8/2000	12/6/2000	12/5/2000	12/6/2000	12/6/2000	12/6/2000	12/6/2000	12/6/2000
ANALYTE	NJ GWQS*												
Metals													
Aluminum	200	48.4 U	48.4 U	119 J	48.4 U	48.4 U	93.5 J	48.4 U	48.4 U	32.4 U	32.4 U	32.4 U	32.4 U
Antimony	20	2.4 U	1.7 U	2.4 U	2.4 U	2.4 U	2.4 U	1.7 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
Arsenic	8	4.3 U	2.3 U	4.3 U	4.3 U	4.3 U	4.3 U	2.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U
Barium	2,000	8.5 J	17.4 J	32.2 J	40.1 J	41.1 J	32.5 J	17.9 J	49.4 J	33.4 J	10.6	28.2 J	6.4 J
Beryllium	20	0.51 J	0.2 U	0.4 U	0.4 U	0.84 J	0.4 U	0.4 J	0.5 J	0.4 U	0.4 U	0.4 U	0.4 U
Cadmium	4	2.1 J	0.3 U	0.6 U	0.99 J	6.9 J	0.6 U	0.59 J	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Copper	1,000	98.2	0.6 U	2.3 U	2.3 U	44.8	2.3 U	0.72 J	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
Iron	300	60.9 U	60.9 U	60.9 U	60.9 U	198	60.9 U	60.9 U	277	101	60.9 U	60.9 U	60.9 U
Lead	10	1.8 U	1.8 J	1.8 U	4.8	3,290	1.8 U	1.3 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
Manganese	50	13.1 J	13.1 J	24.9	44.3	113.6 J	41.3	20.2	143 J	18.5	6.2 U	6.2 U	6.2 U
Mercury	2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.43
Nickel	100	14.5 J	1.8 J	2.8 J	5.6 J	35 J	11.4 J	1.3 U	9.6 J	3 J	2.1 U	2.1 U	2.1 U
Silver	N/A	1 U	0.7 U	1 U	1 U	1 U	1 U	0.7 U	1 U	1 U	1 U	1 U	1 U
Sodium	50,000	9,310	1,280 J	1,810 J	3,890 J	13,200	23,200	2,060 J	6,330	14,600	15,000	17,600	18,900
Thallium	10	3.3 U	3.6 U	3.3 U	3.3 U	3.3 U	3.3 U	3.6 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
Zinc	5,000	328	16.9 J	27.6	206	1410	115	13.5 J	60.9	30	12.1	16.8 J	10.8 J

SAMPLE LOCATION		MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-13D	MW-14D	MW-15D	MW-16D	MW-17D	MW-18D
SAMPLE ID		MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-13D	MW-14D	MW-15D	MW-16D	MW-17D	MW-18D
LAB ID		E82056-26	E81966-12	E82056-21	E82056-40	E81966-13	E82056-8	E82056-25	E81966-11	E82056-22	E82056-39	E81966-14	E82056-9
DATE		12/6/2000	12/4/2000	12/6/2000	12/8/2000	12/5/2000	12/6/2000	12/6/2000	12/4/2000	12/6/2000	12/8/2000	12/5/2000	12/6/2000
ANALYTE	NJ GWQS*												
Metals													
Aluminum	200	48.4 U	48.4 U	305 J	32.4 U	48.4 U	32.4 U	32.4 U	48.4 U	32.4 U	32.4 U	48.4 U	32.4 U
Antimony	20	2.4 U	1.7 U	2.4 U	2.4 U	1.7 U	3.9 J	2.4 U	1.7 U	2.4 U	2.4 U	1.7 U	2.4 U
Arsenic	8	4.3 U	2.3 U	4.3 U	4.3 U	2.3 U	4.3 U	50.4 J	23.7 J	31.4 J	6.7 J	2.7 J	4.3 U
Barium	2,000	35 J	41.2 J	43.7 J	379	10.7 J	7.9 J	31.5 J	135 J	30.2 J	34.7 J	9.8 J	3.9 J
Beryllium	20	1.1 J	0.2 U	0.4 U	0.4 U	0.2 U	0.4 U	0.4 U	0.2 U	0.4 U	0.4 U	0.2 U	0.4 U
Cadmium	4	5.3 J	0.3 U	0.6 U	0.6 U	0.3 U	0.6 U	0.6 U	0.34 J	0.6 U	0.6 U	0.3 U	0.6 U
Copper	1,000	2.3 U	0.6 U	2.8 J	2.3 U	0.66 J	2.3 U	2.3 U	0.6 U	2.1 U	2.3 U	0.6 U	2.3 U
Iron	300	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U	60.9 U
Lead	10	1.8 U	1.3 U	1.8 U	1.8 U	1.3 U	1.8 U	1.8 U	1.3 U	1.8 U	1.8 U	1.3 U	1.8 U
Manganese	50	13.1 J	13.1 J	24.9	44.3	113.6 J	16.9	38	143 J	183	103	18.4	17.6 J
Mercury	2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	100	26.7 J	6.9 J	6.2 J	4 J	3.5 J	2.3 J	2.1 U	1.3 U	2.1 U	2.1 U	1.4 J	2.7 J
Silver	N/A	1 U	0.7 U	1 U	1 U	0.7 U	1 U	1 U	0.7 U	1 U	1 U	0.7 U	1 U
Sodium	50,000	24,700	10,000	4,720 J	19,100	15,400	18,300	22,400	17,900	26,600	20,000	25,800	27,100
Thallium	10	3.3 U	3.6 U	3.3 U	3.3 U	3.6 U	3.3 U	3.3 U	3.6 U	3.3 U	3.3 U	3.6 U	3.3 U
Zinc	5,000	490	16.3 J	45.7	13.9 J	17 J	19.7 J	14.1 J	8.6 J	10.7 J	10.8 J	6.4 J	7.9 J

Notes: * GWQS = New Jersey Ground Water Quality Standards; Compounds not listed did not meet or exceed criteria in any sample.
 - Shaded values meet or exceed New Jersey Ground Water Quality Standards. Bold values indicated detections above MDL.
 - All results in ug/l.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value.

TABLE 5-20
Matteo Iron and Metal
Potable Well Sample Results: Round 1 (December 4 to 8, 2000)

SAMPLE LOCATION		PW-1	PW-1	PW-2
SAMPLE ID		HOUWELL	PWDUP-1	MIMWELL
LAB ID		E81965-2	E81965-3	E81965-1
DATE		12/5/2000	12/5/2000	12/4/2000
ANALYTE	NJDWS*			
Volatile Organic Compounds				
Benzene	1	0.25 U	0.25 U	0.25 U
Chloroform	100	0.3 U	0.3 U	0.3 U
cis-1,2-Dichloroethene	70	0.32 U	0.32 U	0.32 U
Ethylbenzene	700	0.31 U	0.31 U	0.31 U
Vinyl chloride	2	0.32 U	0.32 U	0.32 U
Xylene (total)	1,000	0.58 U	0.58 U	0.58 U
Semi-Volatile Organic Compounds				
2,4-Dimethylphenol	NC	NT	NT	NT
Benzo(a)anthracene	NC	NT	NT	NT
Benzo(a)pyrene	0.2	0.02 U	0.02 U	0.02 U
Benzo(b)fluoranthene	NC	NT	NT	NT
Benzo(k)fluoranthene	NC	NT	NT	NT
bis(2-Ethylhexyl)phthalate	6	0.6 U	0.6 U	0.6 U
Dibenz(a,h)anthracene	NC	NT	NT	NT
Indeno(1,2,3-cd)pyrene	NC	NT	NT	NT
Pesticide & PCB				
Dieldrin	NC	0.1 U	0.1 U	0.1 U
Aroclor 1248	0.5	0.1 U	0.1 U	0.1 U
Aroclor 1254	0.5	0.1 U	0.1 U	0.1 U
Aroclor 1260	0.5	0.2 U	0.2 U	0.2 U
Metals				
Aluminum	200	150 U	150 U	150 U
Antimony	6	5 U	5 U	5 U
Arsenic	50	5 U	5 U	5 U
Barium	2,000	200 U	200 U	200 U
Beryllium	4	3 U	3 U	3 U
Cadmium	5	4 U	4 U	4 U
Chromium	100	10 U	10 U	10 U
Copper	1,300	25 U	25 U	25 U
Iron	300	680	690	27,400
Lead	15	3 U	3 U	3 U
Manganese	50	22	22	270
Mercury	2	0.2 U	0.2 U	0.2 U
Nickel	NC	40 U	40 U	40 U
Silver	100	10 U	10 U	10 U
Sodium	NC	54,600	55,600	25,800
Thallium	NC	2 U	2 U	2 U
Zinc	5,000	110	89	20 U

Notes:

- NJDWS* = New Jersey Drinking Water Standards - November, 1996 N.J. MCL [A-280]. Analytes not listed did not meet or exceed criteria in any sample.
- Shaded values meet or exceed New Jersey Drinking Water Standards
- Bold indicate concentrations above MDL.
- All results in ug/l.
- U = Not detected above the Contract Required Quantitation Limit (CRQL).
- NC = No Criteria.
- NT = Not tested.

TABLE 5-21
Matteo Iron and Metal
Groundwater Monitoring Well Results: Round 2 (January 25 to February 2, 2001)

SAMPLE LOCATION		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12
SAMPLE ID		MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09	MW-10	MW-11	MW-12
LAB ID		E85211-11	E84957-1	E85211-3	E85211-6	E84958-12	E84958-13	E85211-5	E85211-12	E84957-5	E84957-6	E85211-8	E85211-1
DATE		2/1/2001	1/26/2001	2/1/2001	2/1/2001	1/31/2001	1/31/2001	2/1/2001	2/2/2001	1/26/2001	1/26/2001	1/31/2001	2/1/2001
ANALYTE	NJ GWQS*												
Volatile Organic Compounds													
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylene (total)	40	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds													
2,4-Dimethylphenol	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	30	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pesticide & PCB													
Dieldrin	0.03	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aroclor 1248	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor 1254	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor 1260	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Metals													
Aluminum	200	160 J	51.4 J	134 J	462 J	719 J	1,930 J	2,234 J	8,480 J	435 J	271 J	628 J	377 J
Antimony	20	2.4 U	2.4 U	2.4 U	2.4 U	5.9 J	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
Arsenic	8	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	82.9 J	4.3 U	7.3 J	4.3 U	4.3 U	4.3 U	4.3 U
Barium	2,000	12.1 J	8.2 J	29.3 J	44.8 J	53.4 J	28.9 J	19.4 J	71.7 J	38.6 J	5.5 J	39.4 J	9.7 J
Beryllium	20	0.46 J	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.61 J	0.4 U	0.4 U	0.4 U	0.4 U
Chromium	100	29	1.9 U	1.9 U	2.3 J	20.8	11.3	3.2 J	164 J	3.1 J	10.8	5.7 J	2.3 J
Cadmium	4	2.2 J	0.6 U	0.6 U	0.65 J	8.6 J	0.74 J	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Copper	1,000	137	2.3 U	2.8 J	2.3 U	35.2	6.5 J	2.3 U	9.8 J	2.3 U	2.3 U	2.3 U	2.3 U
Iron	300	792 J	60.9 U	60.9 U	190	700	2,930 J	301	16,900	532	949	2,050	1,130
Lead	10	6.8	1.8 U	1.8 U	3	1,320	3	4.9	14.5	1.8 U	2.1 J	2.9 J	1.8 U
Manganese	50	65.2 J	9.6 J	13.7 J	103 J	69.3 J	35.3	23	92.9 J	27.4	6.2 U	6.2 U	6.2 U
Mercury	2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	100	33.1 J	4.1 J	2.1 U	11.7 J	46.4	14.8 J	2.2 J	174 J	10 J	12 J	2.8 J	2.1 U
Silver	N/A	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sodium	50,000	6,310 J	1,150 J	1,900 J	4,920 J	5,750	18,400	2,360 J	26,800 J	13,400	13,700	19,800 J	18,800 J
Thallium	10	3.3 U	7.7 J	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	4.6 J	4.3 J	3.3 U	3.3 U
Zinc	5,000	329	6.7 U	33.7	617	1,760	176	10.9 J	73.7	24.1	6.7 U	23.1	11.4 J

Notes: * GWQS = New Jersey Ground Water Quality Standards: Compounds not listed did not meet or exceed criteria in any sample.
 - Shaded values meet or exceed New Jersey Ground Water Quality Standards. Bold values indicated detections above MDL.
 - All results in ug/l.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value.
 - Low Flow sampling procedures were used to purge/collect samples.

TABLE 5-11
Mallico Iron and Metal
Groundwater Monitoring Well Results: Round 2 (January 25 to February 2, 2001)

SAMPLE LOCATION		MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-13D	MW-14D	MW-15D	MW-16D	MW-17D	MW-18D
SAMPLE ID		MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-13D	MW-14D	MW-15D	MW-16D	MW-17D	MW-18D
LAB ID		E84958-5	E84958-8	E84958-15	E84958-9	E84958-17	E84958-3	E84958-6	E84958-7	E84958-16	E85211-4	E84958-18	E84958-4
DATE		1/29/2001	1/29/2001	1/31/2001	1/30/2001	1/31/2001	1/26/2001	1/29/2001	1/29/2001	1/31/2001	2/1/2001	1/31/2001	1/26/2001
ANALYTE	NJ GWQS*												
Volatile Organic Compounds													
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	6	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	6 J	15	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	17	11	8 J	10 U	10 U
Xylene (total)	40	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds													
2,4-Dimethylphenol	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Benzo(a)anthracene	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Benzo(a)pyrene	0.2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Benzo(k)fluoranthene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
bis(2-Ethylhexyl)phthalate	30	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Dibenz(a,h)anthracene	1	10 U	10 U	10 U	10 U	10 U	3 J	10 U	10 U	1 J	10 U	10 U	11 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Pesticide & PCB													
Dieldrin	0.03	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aroclor 1248	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor 1254	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor 1260	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Metals													
Aluminum	200	57.2 J	57.2 J	57.2 J	32.4 U	681	194 J	34.3 J	313	176 J	106 J	240	109 J
Antimony	20	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	12.2 J	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
Arsenic	8	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U	58.9	23.6	42.2	5.1 J	4.3 U	4.3 U
Barium	2,000	41 J	45.6 J	44.8 J	366	10.3 J	11.5 J	33.1 J	143 J	35.3 J	41.1 J	11.8 J	7.8 J
Beryllium	20	0.71 J	0.4 U	0.65 J	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Cadmium	4	2.4 J	0.6 U	0.68 J	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Chromium	100	58.2	4.3 J	5.4 J	1.9 U	3.5 J	21.3	2.7 J	9 J	14.5	4 J	8.4 J	14.7
Copper	1,000	3.1 J	2.3 U	18.4 J	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.1 U	6.7 J	2.1 U
Iron	300	170	402	580	1,840	891	1,720	53,100	48,900	24,400	15,500	912	631
Lead	10	1.8 U	1.8 U	6.6	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	7.3	1.8 U
Manganese	50	137	87.7	70.5	520	19.1	11.2 J	642	1789	187	111	12.7 J	16.2
Mercury	2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	100	68.9	7.6 J	8.8 J	2.1 U	3.9 J	12.1 J	2.1 U	3.9 J	9.6 J	2.1 U	4.9 J	10.7 J
Silver	N/A	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sodium	50,000	19,500	12,000	5,080	20,000	13,900	23,500	19,300	15,700	25,700	20,700 E	26,400	28,000
Thallium	10	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.1 U
Zinc	5,000	237	8 J	58.8	6.7 U	10 J	12.7 J	6.7 U	6.7 U	6.7 U	6.7 U	26.8	16.3 J

Notes: - * GWQS = New Jersey Ground Water Quality Standards: Compounds not listed did not meet or exceed criteria in any sample.
 - Shaded values meet or exceed New Jersey Ground Water Quality Standards. Bold values indicated detections above MDL.
 - All results in ug/l.
 - U = Not detected above the Contract Required Quantitation Limit (CRQL).
 - J = Estimated value.
 - Low Flow sampling procedures were used to purge/collect samples.

TABLE 5-22

Matteo Iron and Metal

Potable Well Sample Results: Round 2 (January 25 to February 2, 2001)

SAMPLE LOCATION		PW-1	PW-1	PW-2
SAMPLE ID		PW-1	PWDUP-1	PW-2
LAB ID		E84958-1A	E84957-4A	E84957-2A
DATE		1/26/2001	1/26/2001	1/26/2001
ANALYTE	NJDWS*			
Volatile Organic Compounds				
Benzene	1	0.25 U	0.25 U	0.25 U
Chloroform	100	0.3 U	0.3 U	0.3 U
cis-1,2-Dichloroethene	70	0.32 U	0.32 U	0.32 U
Ethylbenzene	700	0.31 U	0.31 U	0.31 U
Vinyl chloride	2	0.32 U	0.32 U	0.32 U
Xylene (total)	1,000	0.31 U	0.31 U	0.31 U
Semi-Volatile Organic Compounds				
2,4-Dimethylphenol	NC	NT	NT	NT
Benzo(a)anthracene	NC	NT	NT	NT
Benzo(a)pyrene	0.2	0.02 U	0.02 U	0.02 U
Benzo(b)fluoranthene	NC	NT	NT	NT
Benzo(k)fluoranthene	NC	NT	NT	NT
bis(2-Ethylhexyl)phthalate	6	0.6 U	0.6 U	0.6 U
Dibenz(a,h)anthracene	NC	NT	NT	NT
Indeno(1,2,3-cd)pyrene	NC	NT	NT	NT
Pesticide & PCB				
Dieldrin	NC	0.1 U	0.1 U	0.1 U
Aroclor 1248	0.5	0.1 U	0.1 U	0.1 U
Aroclor 1254	0.5	0.1 U	0.1 U	0.1 U
Aroclor 1260	0.5	0.2 U	0.2 U	0.2 U
Metals				
Aluminum	200	150 U	150 U	150 U
Antimony	6	5 U	5 U	5 U
Arsenic	50	5 U	5 U	5 U
Barium	2,000	200 U	200 U	200 U
Beryllium	4	3 U	3 U	3 U
Cadmium	5	4 U	4 U	4 U
Chromium	100	10 U	10 U	10 U
Copper	1,300	25 U	25 U	25 U
Iron	300	1,700	1,700	26,900
Lead	15	3 U	3 U	3 U
Manganese	50	32	32	260
Mercury	2	0.2 U	0.2 U	0.2 U
Nickel	NC	40 U	40 U	40 U
Silver	100	10 U	10 U	10 U
Sodium	NC	52,500	53,400	25,500
Thallium	NC	2 U	2 U	2 U
Zinc	5,000	68	62	20 U

Notes:

- NJDWS* = New Jersey Drinking Water Standards - November, 1996 N.J. MCL [A-280]. Analytes not listed did not meet or exceed criteria in any sample.
- Shaded values meet or exceed New Jersey Drinking Water Standards - November, 1996.
- Bold indicate concentrations above MDL.
- All results in ug/l.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- NC = No Criteria.
- NT = Not tested.

TABLE 5-23
Matteo Iron Metal
Groundwater Monitoring Sample Results: Round 3 (April 9 and 10, 2002)

SAMPLE LOCATION		MW-10D	MW-11D	MW-14D	MW-14D	MW-15D	MW-16D	MW-18D	FB-01	FB-02	TB				
SAMPLE ID		MW-10D	MW-11D	MW-14D	GW DUPE	MW-15D	MW-16D	MW-18D	FB-01	FB-02	TB				
LAB ID		N12137-4	N12137-6	N12137-1	N12137-9	N12137-2	N12137-5	N12137-3	N12137-7	N12137-8	N12137-10				
DATE		4/9/2002	4/10/2002	4/9/2002	4/9/2002	4/9/2002	4/10/2002	4/9/2002	4/9/2002	4/10/2002	4/10/2002				
ANALYTE	NJ GWQS*	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D	Result	Q D
Volatile Organic Compounds															
Benzene	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1
Chloroform	6	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1
cis-1,2-Dichloroethene	70	10 U	1	10 U	1	1 J	1	8 J	1	10 U	1	10 U	1	10 U	1
Ethylbenzene	700	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1
Vinyl chloride	5	10 U	1	10 U	1	15 J	1	12 J	1	7 J	1	3 J	1	10 U	1
Xylene (total)	40	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1	10 U	1
Metals															
Aluminum	200	691	1	480	1	236	1	275	1	166	1	253	1	84.9	1
Antimony	20	2.9 U	1	2.9 U	1	2.9 U	1	2.9 U	1	2.9 U	1	2.9 U	1	2.9 U	1
Arsenic	8	5.8 J	1	3 U	1	29	1	32.8	1	34.2	1	4.1 J	1	3 U	1
Barium	2,000	21.4 J	1	55.8 J	1	157 J	1	167 J	1	22.8 J	1	36 J	1	13.4 J	1
Beryllium	20	0.3 U	1	0.3 U	1	0.3 U	1	0.3 U	1	0.3 U	1	0.3 U	1	0.3 U	1
Cadmium	4	0.3 U	1	0.3 U	1	0.3 U	1	0.79 J	1	0.3 U	1	0.3 U	1	0.42 J	1
Chromium	100	2.6 J	1	3.9 J	1	2.5 J	1	3 J	1	0.7 U	1	1.2 J	1	1.4 J	1
Copper	1,000	1.8 U	1	2.1 J	1	1.8 U	1	1.8 U	1	1.8 U	1	1.8 U	1	1.8 U	1
Iron	300	12,200	1	3,950	1	57,000	1	55,200	1	15,200	1	15,300	1	1,200	1
Lead	10	2.6 J	1	4.4	1	2.2 U	1	2.2 U	1	2.2 U	1	2.4 J	1	2.2 U	1
Manganese	50	241	1	120	1	871	1	871	1	132	1	130	1	15.2	1
Mercury	2	0.07 U	1	0.07 U	1	0.07 U	1	0.07 U	1	0.07 U	1	0.07 U	1	0.07 U	1
Nickel	100	7.7 J	1	11 J	1	6 J	1	5.2 J	1	6 J	1	7.8 J	1	7.2 J	1
Silver	N/A	1.2 U	1	1.2 U	1	1.2 U	1	1.2 U	1	1.2 U	1	1.2 U	1	1.2 U	1
Sodium	50,000	28,000	1	26,300	1	17,100	1	17,000	1	21,900	1	21,400	1	23,400	1
Thallium	10	5.9 U	1	5.9 U	1	5.9 U	1	5.9 U	1	5.9 U	1	5.9 U	1	5.9 U	1
Zinc	5,000	17.5 J	1	46.4	1	13.7 J	1	15.2 J	1	11.9 J	1	13.2 J	1	31	1

- Notes:
- * NJDEP GWQS = New Jersey Ground Water Quality Standards (N.J.A.C. 7:9-6 9/98) compounds not listed did not meet or exceed criteria in any sample.
 - Bold values indicate detections.
 - Shaded values meet or exceed New Jersey Ground Water Quality Standards - Higher of PQLs and Ground Water Quality Criteria (N.J.A.C. 7:9-6 9/98). Bold values indicate concentrations above MDL.
 - All results in ug/l.
 - U = Not detected above the Contact Required Quantitation Limit (CRQL).
 - J = Estimated value, below the CRQL.
 - Standard purge & collection procedures were used to sample the wells samples.

TABLE 5-25
Matteo Iron and Metal
Seep Sample Results

Sample Location	Sample ID	Lab ID	Date	Lead (ug/l) Filtered	Lead (ug/l) Unfiltered	Hardness (mg/l)	Lead (ug/l) Filtered	Lead (ug/l) Unfiltered	Lead (ug/l) Corrected	Lead (ug/l) Filtered	Lead (ug/l) Unfiltered
New Jersey Quality Standards				10	10	250	5	5	5		
				Groundwater			Human				
							Ecological				
SP-1	SP-1F	E80831-9	11/16/2000	1.3 U	1.3 U		1.3 U	2.7		1.3 U	
	SP-1U	E80831-8	11/16/2000		71.1	108		71.1			71.1
SP-2	SP-2F	E80831-11	11/16/2000	1.3 U	1.3 U		1.3 U	2.8		1.3 U	
	SP-2U	E80831-10	11/16/2000		29.1	110		29.1			29.1
SP-3	SP-3F	E80831-13	11/16/2000	5.2			5.2		2.5		
	SP-3U	E80831-12	11/16/2000								5.2
SP-4	SP-4F	E80831-15	11/16/2000	1.4 J			1.4 J		2.4		
	SP-4U	E80831-14	11/16/2000		82.6	96		82.6		1.4 J	82.6
SP-5	SP-5F	E80831-17	11/16/2000	1.3 U			1.3 U		5.2		
	SP-5U	E80831-16	11/16/2000		2,370	196		2,370		1.3 U	2,370
SP-6	SP-6F	E81101-11	11/16/2000	9.4			9.4		2.5		
	SP-6U	E81101-10	11/16/2000		1,280	98		1,280		9.4	1,280
SP-7	SP-7F	E81101-13	11/16/2000	2.3 U			2.3 U		4.0		
	SP-7U	E81101-12	11/16/2000		110	152		110		2.3 U	110
SP-8	SP-8F	E81101-15	11/17/2000	11.7			11.7		2.6		
	SP-8U	E81101-14	11/17/2000		74.9	104		74.9		11.7	74.9
SP-9	SP-9F	E81101-17	11/17/2000	27.5			27.5		3.0		
	SP-9U	E81101-16	11/17/2000		147	118		147		27.5	147
SP-9U - SP DUP-1	SP-9U	E81101-1	11/17/2000		318	102		318			318
	SP-10F	E81101-19	11/17/2000	13.6			13.6		2.4		
SP-10	SP-10U	E81101-18	11/17/2000		54.4	94		54.4		13.6	54.4

Notes:

NJDEP GWQS = New Jersey Ground Water Quality Standards (N.J.A.C. 7:9-6 9/98)

NJDEP Surface Water Quality Standards (N.J.A.C. 5/00)

Aquatic SWQS for Lead is 2.5 ug/l (total)

Aquatic SWQS for Lead (dissolved) is dependent on hardness. The following equations will provide the new criteria.

Chronic criterion (dissolved) = WER x $e^{(mC(\ln(\text{hardness})) - bc)}$ x chronic CF

chronic CF = 1.46203 - ((ln hardness)(0.145712))

Shaded values meet or exceed New Jersey Quality Standards.

Bold values indicates concentrations above MDL.

Delaware River Basin Commission - Administrative Manual - Part 111 (October 23, 1995) TABLE 5: Stream Quality Objectives for

Toxic Pollutants for the Protection of Aquatic Life in the Delaware River Estuary - Lead is 16 ug/l.

U = Not detected above the Contact Required Quantitation Limit (CRL).

J = Estimated value.

TABLE 5-24
Matteo Iron & Metal
Potable Well Sample Results from PW-3

Sample ID	NJ Groundwater	NJ Drinking Water	PW-3	PW-3	PW-3
Lab Sample ID	Quality	Standards		N1485-1	N2393-1
Sampling Date	Standards		4/24/1998	10/25/2001	11/8/2001
Matrix				Drinking Water	Drinking Water
Units			ug/l	ug/l	ug/l
GC/MS Volatiles (EPA 524.2 REV 4.1)			Result	Result	Result
Acetone	700	NC	NT	2.6	2.4
cis-1,2-Dichloroethylene	10	70	NT	2.2	2.4
Methyl Tert Butyl Ether	NC	70*	NT	0.7	0.41
Vinyl chloride	5	2	NT	3.5	4.8
TOTAL TARGETED GC/MS Volatiles			NT	9	10.01
TOTAL NON-TARGETED GC/MS Volatiles	NC		NT	7.53	8.6
TOTAL GC/MS Volatiles			NT	16.53	18.61
Metals Analysis			Result	Result	Result
Arsenic	8	50	NT	9	15
Calcium	NC	NC	NT	19,800	19,600
Iron	300	300	11,870	18,200	18,500
Magnesium	NC	NC	NT	6,000	5,900
Manganese	50	50	166	170	170
Sodium	50,000	NC	NT	20,200	19,600
Zinc	5,000	5,000	NT	54	43

Notes

- NJDWS* = New Jersey Drinking Water Standards - November, 1996 N.J. MCL [A-280]. Analytes not listed did not meet or exceed criteria in any sample.
- Shaded values meet or exceed New Jersey Drinking Water Standards - November, 1996.
- Bold indicate concentrations above MDL.
- All results in ug/l.
- U = Not detected above the Contact Required Quantitation Limit (CRQL).
- NC = No Criteria.
- NT = Not tested.

TABLE S-26
Matteo Iron and Metal
Sediment Sample Results: Lead

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Lead-Low Level (31 mg/kg)	Lead-High Level (250 mg/kg)	pH (su)
T1-A	T1-AA	E81104-1	11/16/2000	0-0.5	49.3	49.3	6
	T1-AB	E81104-2	11/16/2000	1-2	33.3	33.3	5.2
	T1-AC	E81104-3	11/16/2000	2-3	19	19	5
T1-B	T1-BA	E81104-4	11/16/2000	0-0.5	58.4	58.4	5.2
	T1-BB	E81104-5	11/16/2000	1-2	41.1	41.1	5.5
	T1-BC	E81104-6	11/16/2000	2-3	57	57	5.5
T1-C	T1-CA	E81104-11	11/16/2000	0-0.5	131	131	6.2
	T1-CB	E81104-12	11/16/2000	1-2	40.9	40.9	6.2
	T1-CC	E81104-13	11/16/2000	2-3	9.6	9.6	4.8
T1-D	T1-DA	E81104-7	11/16/2000	0-0.5	128	128	6.4
	TDUP-21/T1-DA	E81104-10	11/16/2000	0-0.5	282	282	6.4
	T1-DB	E81104-8	11/16/2000	1-2	158	158	4.9
	T1-DC	E81104-9	11/16/2000	2-3	25.1	25.1	4.9
T1-E	T1-EA	E81104-14	11/16/00	0-0.5	76.3	76.3	6
	T1-EB	E81104-15	11/16/2000	1-2	22	22	5.8
	T1-EC	E81104-16	11/16/2000	2-3	6.9	6.9	5.7
T2-A	T2-AA	E79744-13	10/31/2000	0-0.5	205	205	5.4
	T2-AB	E79744-14	10/31/2000	1-2	246	246	5.7
	T2-AC	E79744-15	10/31/2000	2-3	246	246	5.4
T2-B	T2-BA	E79745-10	10/31/2000	0-0.5	183	183	6.7
	T2-BB	E79745-11	10/31/2000	1-2	258	258	5.7
	T2-BC	E79744-12	10/31/2000	2-3	40.9	40.9	5.5
T2-C	T2-CA	E79745-7	10/31/2000	0-0.5	103	103	6.3
	T2-CB	E79745-8	10/31/2000	1-2	58.5	58.5	6.3
	T2-CC	E79745-9	10/31/2000	2-3	18.4	18.4	5.6
T2-D	T2-DA	E79745-4	10/31/2000	0-0.5	112	112	5.3
	T2-DB	E79745-5	10/31/2000	1-2	110	110	5.8
	T2-DC	E79745-6	10/31/2000	2-3	84.5	84.5	5.5
T2-E	T2-EA	E79745-1	10/31/2000	0-0.5	177	177	5.8
	T2-EB	E79745-2	10/31/2000	1-2	143	143	5.6
	T2-EC	E79745-3	10/31/2000	2-3	169	169	5.5
T3-A	T3-AA	E80832-1	11/15/2000	0-0.5	200	200	7.5
	T3-AB	E80832-2	11/15/2000	1-2	322	322	6
	T3-AC	E80832-3	11/15/2000	2-3	358	358	6
T3-B	T3-BA	E80832-4	11/15/2000	0-0.5	162	162	6.3
	T3-BB	E80832-5	11/15/2000	1-2	236	236	5.8
	T3-BC	E80832-6	11/15/2000	2-3	291	291	6.3
T3-C	T3-CA	E80833-8	11/15/2000	0-0.5	89.4	89.4	5.8
	T3-CB	E80833-9	11/15/2000	1-2	8.6	8.6	6.4
	T3-CC	E80833-10	11/15/2000	2-3	8.5	8.5	5.6
T3-D	T3-DA	E80831-5	11/15/2000	0-0.5	144	144	6.2
	T3-DB	E80831-6	11/15/2000	1-2	222	222	5.3
	T3-DC	E80831-7	11/15/2000	2-3	306	306	6
T3-E	T3-EA	E80832-7	11/15/2000	0-0.5	161	161	5.4
	TDUP-20/T3-EA	E80832-10	11/15/2000	0-0.5	191	191	6.7
	T3-EB	E80832-8	11/15/2000	1-2	177	177	6.1
T4-C	T3-EC	E80832-9	11/15/2000	2-3	206	206	5.9
	T4-CA	E79744-16	10/30/2000	0-0.5	69.4	69.4	6.5
	TDUP5/T4-CA	E79744-19	10/30/2000	0-0.5	57.2	57.2	6.7
T4-D	T4-CB	E79744-17	10/30/2000	1-2	28.9	28.9	6.3
	T4-CC	E79744-18	10/30/2000	2-3	21.3	21.3	6.1
	T4-DA	E79744-20	10/30/2000	0-0.5	271	271	5
T4-E	T4-DB	E79744-21	10/30/2000	1-2	202	202	5.4
	T4-DC	E79744-22	10/30/2000	2-3	380	380	5.6
	T4-EA	E79744-1	10/30/2000	0-0.5	381	381	6.2
T5-C	T4-EB	E79744-2	10/30/2000	1-2	1,050	1,050	4.9
	T4-EC	E79744-3	10/30/2000	2-3	391	391	5.5
	T5-CA	E79743-8	10/31/2000	0-0.5	88.4	88.4	6.9
T5-D	T5-CB	E79743-9	10/31/2000	1-2	13.8	13.8	5.9
	T5-CC	E79743-10	10/31/2000	2-3	12.3	12.3	5.8
	T5-DA	E79743-5	10/30/2000	0-0.5	431	431	5.5
T5-E	T5-DB	E79743-6	10/30/2000	1-2	232	232	5.8
	T5-DC	E79743-7	10/30/2000	2-3	238	238	5.8
	T5-EA	E79743-2	10/30/2000	0-0.5	14.5	14.5	5.8
T6-C	T5-EB	E79743-3	10/30/2000	1-2	17.9	17.9	5.7
	T5-EC	E79743-4	10/30/2000	2-3	11.1	11.1	5.1
	T6-CA	E79744-10	10/30/2000	0-0.5	25.3	25.3	5.4
T6-D	T6-CB	E79744-11	10/30/2000	1-2	33	33	5.8
	T6-CC	E79743-1	10/30/2000	2-3	10.5	10.5	5.6
	T6-DA	E79744-7	10/30/2000	0-0.5	216	216	6
T6-E	T6-DB	E79744-8	10/30/2000	1-2	243	243	5.9
	T6-DC	E79744-9	10/30/2000	2-3	206	206	5.8
	T6-EA	E79744-4	10/30/2000	0-0.5	2,070	2,070	5.8
T7-C	T6-EB	E79744-5	10/30/2000	1-2	262	262	6
	T6-EC	E79744-6	10/30/2000	2-3	220	220	5.8
	T7-CA	E79745-13	10/31/2000	0-0.5	25.5	25.5	6.1
T7-C	T7-CB	E79745-14	10/31/2000	1-2	15.5	15.5	5.6
	T7-CC	E79745-15	10/31/2000	2-3	17.5	17.5	5.9

TABLE 5-26
Manteo Iron and Metal
 Sediment Sample Results: Lead

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Lead-Low Level (31 mg/kg)	Lead-High Level (250 mg/kg)	pH (su)
T7-D	T7-DA	E79745-16	10/31/2000	0-0.5	36.7	36.7	5.8
	T7-DB	E79745-17	10/31/2000	1-2	135	135	5.8
	T7-DC	E79745-18	10/31/2000	2-3	141	141	5.9
T7-E	T7-EA	E79743-11	10/31/2000	0-0.5	1,990	1,990	5.1
	T7-EB	E79743-12	10/31/2000	1-2	62	62	5.2
	T7-EC	E79743-13	10/31/2000	2-3	130	130	5.5
T8-C	T8-CA	E79743-20	10/31/2000	0-0.5	25.3	25.3	6
	TDUP6/T8-CA	E79745-12	10/31/2000	0-0.5	173	173	6.2
	T8-CB	E79743-21	10/31/2000	1-2	201	201	6.6
	T8-CC	E79743-22	10/31/2000	2-3	28.4	28.4	5.6
T8-D	T8-DA	E79743-17	10/31/2000	0-0.5	34.1	34.1	5.8
	T8-DB	E79743-18	10/31/2000	1-2	169	169	6.1
	T8-DC	E79743-19	10/31/2000	2-3	24.6	24.6	6.2
T8-E	T8-EA	E79743-14	10/31/2000	0-0.5	788	788	5.8
	T8-EB	E79743-15	10/31/2000	1-2	71.8	71.8	5.5
	T8-EC	E79743-16	10/31/2000	2-3	31.4	31.4	5.2
T9-A	T9-AA	E80555-7	11/10/2000	0-0.5	172	172	5.6
	TDUP-17/T9-AA	E80555-10	11/10/2000	0-0.5	137	137	5.6
	T9-AB	E80555-8	11/10/2000	1-2	228	228	5.7
T9-B	T9-AC	E80555-9	11/10/2000	2-3	271	271	6
	T9-BA	E80555-11	11/10/2000	0-0.5	158	158	5.6
	T9-BB	E80555-12	11/10/2000	1-2	248	248	6.2
T9-C	T9-BC	E80555-13	11/10/2000	2-3	245	245	5.8
	T9-CA	E80555-4	11/10/2000	0-0.5	142	142	6
	T9-CB	E80555-5	11/10/2000	1-2	224	224	6.4
T9-D	T9-CC	E80555-6	11/10/2000	2-3	16.7	16.7	6.5
	T9-DA	E80555-1	11/10/2000	0-0.5	1,720	1,720	6.7
	T9-DB	E80555-2	11/10/2000	1-2	195	195	6.2
T9-E	T9-DC	E80555-3	11/10/2000	2-3	109	109	6.2
	T9-EA	E80555-14	11/10/2000	0-0.5	15,300	15,300	6.1
	T9-EB	E80555-15	11/10/2000	1-2	25,200	25,200	5.8
T11-A	T9-EC	E80555-16	11/10/2000	2-3	19,500	19,500	5.7
	T11-AA	E79555-11	10/27/2000	0-0.5	181	181	5.3
	T11-AB	E79555-12	10/27/2000	1-2	269	269	5.6
T11-B	T11-AC	E79555-13	10/27/2000	2-3	277	277	5.6
	T11-BA	E79555-14	10/27/2000	0-0.5	152	152	5.9
	T11-BB	E79555-15	10/27/2000	1-2	293	293	5.6
T11-C	T11-BC	E79555-16	10/27/2000	2-3	265	265	5.5
	T11-CA	E79555-8	10/27/2000	0-0.5	223	223	5.6
	T11-CB	E79555-9	10/27/2000	1-2	228	228	5.8
T11-D	T11-CC	E79555-10	10/27/2000	2-3	265	265	5.7
	T11-DA	E79555-4	10/27/2000	0-0.5	232	232	5.8
	TDUP4/T11-DA	E79555-7	10/27/2000	0-0.5	274	274	5.8
T11-E	T11-DB	E79555-5	10/27/2000	1-2	358	358	6.1
	T11-DC	E79555-6	10/27/2000	2-3	214	214	5.7
	T11-EA	E79555-1	10/27/00	0-0.5	2,490	2,490	5.6
T13-A	T11-EB	E79555-2	10/27/2000	1-2	278	278	5.9
	T11-EC	E79555-3	10/27/2000	2-3	277	277	6.2
	T13-AA	E79453-3	10/25/2000	0-0.5	132	132	5.6
T13-B	T13-AB	E79453-4	10/25/2000	1-2	98.6	98.6	5.6
	T13-AC	E79453-5	10/25/2000	2-3	95	95	5.7
	T13-BA	E79452-21	10/25/2000	0-0.5	97.1	97.1	5.8
T13-C	T13-BB	E79453-1	10/25/2000	1-2	55.8	55.8	5.7
	T13-BC	E79453-2	10/25/2000	2-3	191	191	5.4
	T13-CA	E79452-15	10/25/2000	0-0.5	155	155	6.5
T13-D	T13-CB	E79452-16	10/25/2000	1-2	31.9	31.9	6.4
	T13-CC	E79452-17	10/25/2000	2-3	13.3	13.3	6.3
	T13-DA	E79452-18	10/25/2000	0-0.5	179	179	5.8
T13-E	T13-DB	E79452-19	10/25/2000	1-2	168	168	6.1
	T13-DC	E79452-20	10/25/2000	2-3	17.1	17.1	6.4
	T13-EA	E79452-11	10/25/00	2.0-2.5	288	288	8
T14-A	TDUP2/T13-EA	E79452-14	10/25/2000	0-0.5	221	221	6.6
	T13-EB	E79452-12	10/25/2000	1-2	35,200	35,200	6
	T13-EC	E79452-13	10/25/2000	2-3	7,000	7,000	6.2
T14-B	T14-AA	E78963-7	10/18/2000	0-0.5	266	266	5.8
	T14-AB	E78963-8	10/18/2000	1-2	220	220	5.7
	T14-AC	E78963-9	10/18/2000	2-3	162	162	5.8
T14-C	T14-BA	E78963-4	10/18/2000	0-0.5	125	125	6.7
	T14-BB	E78963-5	10/18/2000	1-2	196	196	6.2
	T14-BC	E78963-6	10/18/2000	2-3	214	214	6
T14-D	T14-CA	E78964-6	10/18/2000	0-0.5	10.7	10.7	6.2
	T14-CB	E78964-7	10/18/2000	1-2	9.2	9.2	5.4
	T14-CC	E78964-8	10/18/2000	2-3	10.2	10.2	5.3
T14-E	T14-DA	E78963-1	10/18/2000	0-0.5	668	668	6.5
	T14-DB	E78963-2	10/18/2000	1-2	9.5	9.5	6.4
	T14-DC	E78963-3	10/18/2000	2-3	13.9	13.9	6
T15-AA	T14-EA	E78964-9	10/18/00	1.0-1.5	9,970	9,970	5.5
	T14-EB	E78964-10	10/18/2000	1-2	246	246	5.7
	T14-EC	E78964-11	10/18/2000	2-3	2,240	2,240	5.5
	T15-AA	E78963-18	10/17/2000	0-0.5	168	168	5.9

TABLE S-26
Matteo Iron and Metal
Sediment Sample Results: Lead

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Lead-Low Level (31 mg/kg)	Lead-High Level (250 mg/kg)	pH (su)
T15-A	T15-AB	E78963-19	10/17/2000	1-2	27.8	27.8	5.9
	T15-AC	E78963-20	10/17/2000	2-3	8.9	8.9	6
	T15-BA	E78963-21	10/17/2000	0-0.5	209	209	6.5
T15-B	T15-BB	E78964-1	10/17/2000	1-2	167	167	5.7
	T15-BC	E78964-2	10/17/2000	2-3	68.2	68.2	5.4
	T15-CA	E78964-3	10/18/2000	0-0.5	10.2	10.2	5.9
T15-C	T15-CB	E78964-4	10/18/2000	1-2	10.4	10.4	5.6
	T15-CC	E78964-5	10/18/2000	2-3	8.6	8.6	5.8
T15-D	T15-DA	E78963-15	10/17/2000	0-0.5	10.3	10.3	6.5
	T15-DB	E78963-16	10/17/2000	1-2	8.8	8.8	6.4
	T15-DC	E78963-17	10/17/2000	2-3	11.1	11.1	6.2
T15-E	T15-EA	E78963-11	10/17/00	0-0.5	494	494	6.1
	TDUP-1/T15-EA	E78963-14	10/17/2000	0-0.5	494	494	5.4
	T15-EB	E78963-12	10/17/2000	1-2	262	262	5.7
T16-A	T15-EC	E78963-13	10/17/2000	2-3	274	274	6.1
	T16-AA	E79452-1	10/26/2000	0-0.5	169	169	6.8
	T16-AB	E79452-2	10/26/2000	1-2	186	186	5.9
T16-B	TDUP3/T16-AB	E79452-4	10/26/2000	1-2	171	171	6
	T16-AC	E79452-3	10/26/2000	2-3	21.5	21.5	6.1
	T16-BA	E79452-8	10/26/2000	0-0.5	113	113	6.9
T16-C	T16-BB	E79452-9	10/26/2000	1-2	115	115	6.6
	T16-BC	E79452-10	10/26/2000	2-3	11.8	11.8	5.7
	T16-CA	E79452-5	10/26/2000	0-0.5	93	93	6.8
T16-D	T16-CB	E79452-6	10/26/2000	1-2	12.1	12.1	7
	T16-CC	E79452-7	10/26/2000	2-3	12.6	12.6	6
	T16-DA	E79453-6	10/26/2000	0-0.5	152	152	5.6
T16-E	T16-DB	E79453-7	10/26/2000	1-2	65.5	65.5	5.9
	T16-DC	E79453-8	10/26/2000	2-3	11.5	11.5	6.1
	T16-EA	E79453-9	10/26/00	0-0.5	274	274	5.1
T17-A	T16-EB	E79453-10	10/26/2000	1-2	217	217	5.2
	T16-EC	E79453-11	10/26/2000	2-3	28.8	28.8	5.3
	T17-AA	E79931-16	11/2/2000	0-0.5	171	171	5.8
T17-B	T17-AB	E79931-17	11/2/2000	1-2	168	168	6.1
	T17-AC	E79931-18	11/2/2000	2-3	2130	2130	6.5
	T17-BA	E79931-13	11/2/2000	0-0.5	241	241	6
T17-C	T17-BB	E79931-14	11/2/2000	1-2	1090	1090	5.9
	T17-BC	E79931-15	11/2/2000	2-3	156	156	5.9
	T17-CA	E79932-6	11/2/2000	0-0.5	13.2	13.2	6.4
T17-D	T17-CB	E79932-7	11/2/2000	1-2	11.6	11.6	6.5
	T17-CC	E79932-8	11/2/2000	2-3	10.1	10.1	5.9
	T17-DA	E79932-9	11/2/2000	0-0.5	141	141	6.1
T17-E	TDUP-9/T17-DA	E79932-10	11/2/2000	0-0.5	146	146	6.1
	T17-DB	E79931-11	11/2/2000	1-2	20.9	20.9	6
	T17-DC	E79931-12	11/2/2000	2-3	14.6	14.6	5.8
T18-A	T17-EA	E79931-7	11/01/00	0-0.5	66.8	66.8	6.4
	T17-EB	E79931-8	11/1/2000	1-2	52	52	6.5
	T17-EC	E79931-9	11/1/2000	2-3	8.5	8.5	6.3
T18-B	T18-AA	E80833-1	11/15/2000	0-0.5	127	127	5.9
	T18-AB	E80833-2	11/15/2000	1-2	181	181	6
	T18-AC	E80833-3	11/15/2000	2-3	9.1	9.1	7.1
T18-C	T18-BA	E80833-4	11/15/2000	0-0.5	46.8	46.8	6.7
	TDUP-19/T18-BA	E80833-7	11/15/2000	0-0.5	70.2	70.2	7
	T18-BB	E80833-5	11/15/2000	1-2	26.8	26.8	6.2
T18-D	T18-BC	E80833-6	11/15/2000	2-3	8	8	6.9
	T18-CA	E80720-12	11/13/2000	0-0.5	70.2	70.2	6.6
	T18-CB	E80720-13	11/13/2000	1-2	10.2	10.2	6.7
T18-E	T18-CC	E80720-14	11/13/2000	2-3	10.7	10.7	6
	T18-DA	E80721-9	11/14/2000	0-0.5	27.4	27.4	6.6
	T18-DB	E80721-10	11/14/2000	1-2	23	23	6.7
T19-A	T18-DC	E80720-11	11/13/2000	2-3	98.6	98.6	6.7
	T18-EA	E80721-6	11/14/00	0-0.5	191	191	5.9
	T18-EB	E80721-7	11/14/2000	1-2	117	117	7.1
T19-B	T18-EC	E80721-8	11/14/2000	2-3	34.7	34.7	6
	T19-AA	E79931-4	11/1/2000	0-0.5	177	177	6.3
	T19-AB	E79931-5	11/1/2000	1-2	131	131	6.1
T19-C	T19-AC	E79931-6	11/1/2000	2-3	135	135	5.9
	T19-BA	E79931-1	11/1/2000	0-0.5	112	112	6.6
	T19-BB	E79931-2	11/1/2000	1-2	10.7	10.7	6.7
T19-D	T19-BC	E79931-3	11/1/2000	2-3	10.6	10.6	6.3
	T19-CA	E79933-1	11/1/2000	0-0.5	9.3	9.3	7
	T19-CB	E79933-2	11/1/2000	1-2	9.7	9.7	6.7
T19-E	T19-CC	E79933-3	11/1/2000	2-3	8.9	8.9	6.5

TABLE 5-26
Matteo Iron and Metal
Sediment Sample Results: Lead

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Lead-Low Level (31 mg/kg)	Lead-High Level (250 mg/kg)	pH (su)
T19-D	T19-DA	E79933-8	11/1/2000	0-0.5	12.1	31.6	6.6
	T19-DB	E79933-9	11/1/2000	1-2	12.1	12.1	6.6
	T19-DC	E79933-10	11/1/2000	2-3	6.5	6.5	5.9
T19-E	T19-EA	E79933-4	11/01/00	0-0.5	166	166	6.2
	TDUP-7/T19-EA	E79933-7	11/1/2000	0-0.5	185	185	6.2
	T19-EB	E79933-5	11/1/2000	1-2	9.9	9.9	6.7
	T19-EC	E79933-6	11/1/2000	2-3	9.3	9.3	6.9
	T20-AA	E79931-10	11/2/2000	0-0.5	104	104	5.8
T20-A	T20-AB	E79932-1	11/2/2000	1-2	178	178	6.2
	T20-AC	E79932-2	11/2/2000	2-3	220	220	6.1
	T20-BA	E79932-3	11/2/2000	0-0.5	88.1	88.1	6.6
T20-B	T20-BB	E79932-4	11/2/2000	1-2	57.4	57.4	6
	T20-BC	E79932-5	11/2/2000	2-3	119	119	6.2
	T20-CA	E79932-17	11/2/2000	0-0.5	21.2	21.2	6.1
T20-C	TDUP-8/T20-CA	E79932-20	11/2/2000	0-0.5	25.9	25.9	6.2
	T20-CB	E79932-18	11/2/2000	1-2	72	72	6.5
	T20-CC	E79932-19	11/2/2000	2-3	24.4	24.4	6.3
	T20-DA	E79932-14	11/2/2000	0-0.5	120	120	6.5
T20-D	T20-DB	E79932-15	11/2/2000	1-2	177	177	6.3
	T20-DC	E79932-16	11/2/2000	2-3	153	153	6.3
	T20-EA	E79932-11	11/02/00	0-0.5	87.9	87.9	5.5
T20-E	T20-EB	E79932-12	11/2/2000	1-2	165	165	6
	T20-EC	E79932-13	11/2/2000	2-3	116	116	6.2
	T21-AA	E80047-14	11/03/00	0-0.5	231	231	6.3
T21-A	T21-AB	E80047-15	11/3/2000	1-2	110	110	6.6
	T21-AC	E80047-16	11/3/2000	2-3	100	100	6.5
	T21-BA*	E80157-17	11/6/2000	0-3	160	160	6.8
T21-B	T21-CB*	E80047-17	11/3/2000	0-3	6.9	6.9	7.3
T21-C	T21-DA	E80047-11	11/3/2000	0-0.5	20.3	20.3	6.6
	T21-DB	E80047-12	11/3/2000	1-2	11.8	11.8	6.4
	T21-DC	E80047-13	11/3/2000	2-3	15.7	15.7	6.5
T21-D	T21-EA	E80048-7	11/3/2000	0-0.5	11.7	11.7	6
	TDUP11/T21-EA	E80048-10	11/3/2000	0-0.5	9.3	9.3	6.8
	T21-EB	E80048-8	11/3/2000	1-2	9.7	9.7	6.4
T21-E	T21-EC	E80048-9	11/3/2000	2-3	2.9	2.9	5.9
	T22-AA	E80556-9	11/9/2000	0-0.5	37.6	37.6	6
T22-A	TDUP-16/T22-AA	E80556-19	11/9/2000	0-0.5	96.3	96.3	5.5
	T22-AB	E80556-10	11/9/2000	1-2	189	189	5.8
	T22-AC	E80554-11	11/9/2000	2-3	151	151	6
T22-B	T22-BA	E80554-12	11/9/2000	0-0.5	80.4	80.4	6
	T22-BB	E80554-13	11/9/2000	1-2	48.3	48.3	6
	T22-BC	E80554-14	11/9/2000	2-3	21.1	21.1	6.2
T22-C	T22-CA	E80721-2	11/14/2000	0-0.5	9	9	6.5
	T22-CB	E80721-3	11/14/2000	2-3	7.7	7.7	6.3
	T22-CC	E80721-4	11/14/2000	2-3	14.1	14.1	6.1
T22-D	T22-DA	E80554-15	11/9/2000	0-0.5	12.1	12.1	6
	T22-DB	E80554-16	11/9/2000	1-2	11.5	11.5	6.1
	T22-DC	E80554-17	11/9/2000	2-3	12.7	12.7	5.8
T22-E	T22-EA	E80556-6	11/09/00	0-0.5	98.2	98.2	5.5
	T22-EB	E80556-7	11/9/2000	1-2	126	126	5
	T22-EC	E80556-8	11/9/2000	2-3	157	157	5.5
T23-A	T23-AA	E81102-1	11/17/2000	0-0.5	51.7	51.7	5.9
	T23-AB	E81102-2	11/17/2000	1-2	85.5	85.5	6.4
	T23-AC	E81102-3	11/17/2000	2-3	109	109	6.4
T23-B	T23-BA	E81102-4	11/17/2000	0-0.5	8.8	8.8	7
	TDUP-22/T23-BA	E81102-7	11/17/2000	0-0.5	10.6	10.6	7.1
	T23-BB	E81102-5	11/17/2000	1-2	11.3	11.3	7
T23-C	T23-BC	E81102-6	11/17/2000	2-3	11.7	11.7	6.6
	T23-CA	E81102-8	11/17/2000	0-0.5	41.6	41.6	6.8
	T23-CB*	E81102-9	11/17/2000	0-3	38.8	38.8	5.6
T23-D	T23-DA	E81102-10	11/17/2000	0-0.5	93.3	93.3	6.8
	T23-DB	E81103-1	11/17/2000	1-2	10.8	10.8	6.3
	T23-DC	E81103-2	11/17/2000	2-3	9.1	9.1	6.1
T23-E	T23-EA	E81103-3	11/17/00	0-0.5	98.3	98.3	5
	T23-EB	E81103-4	11/17/2000	1-2	54.3	54.3	5.8
T24-A	T24-AA	E80318-7	11/8/2000	0-0.5	35.6	35.6	6.4
	T24-AB	E80318-8	11/8/2000	1-2	28.8	28.8	6.3
	T24-AC	E80318-9	11/8/2000	2-3	17.1	17.1	6.1
T24-B	T24-BA	E80318-10	11/8/2000	0-0.5	8.7	8.7	5.8
	TDUP14/T24-BA	E80318-13	11/8/2000	0-0.5	9.3	9.3	6.1
	T24-BB	E80318-11	11/8/2000	1-2	9.5	9.5	5.8
T24-D	T24-BC	E80318-12	11/8/2000	2-3	9.1	9.1	5.5
	T24-DA	E80318-14	11/8/2000	0-0.5	138	138	6.2
	T24-DB	E80318-15	11/8/2000	1-2	197	197	6.3
T24-E	T24-DC	E80318-16	11/8/2000	2-3	158	158	6.5
	T24-EA	E80556-3	11/09/00	0-0.5	15.3	15.3	5.4
	T24-EB	E80556-4	11/9/2000	1-2	285	285	5.2
T25-A	T24-EC	E80556-5	11/9/2000	2-3	9.9	9.9	5.2
	T25-AA	E80556-1	11/9/2000	0-0.5	33.2	33.2	6.1
	T25-AB	E80556-2	11/9/2000	1-2	15.7	15.7	5.8

TABLE 5-26
Matco Iron and Metal
Sediment Sample Results: Lead

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Lead-Low Level (31 mg/kg)	Lead-High Level (250 mg/kg)	pH (su)
T25-B	T25-BA	E80554-9	11/9/2000	0-0.5	137	137	6.9
	T25-BB*	E80554-10	11/9/2000	0-3	28.7	28.7	6.9
T25-C	T25-CA	E80554-8	11/9/2000	0-0.5	61.9	61.9	6.7
	T25-CB*	E80554-7	11/9/2000	0-3	55.8	55.8	6.4
T25-D	T25-DA	E80554-4	11/9/2000	0-0.5	37.9	37.9	6.6
	T25-DB	E80554-5	11/9/2000	1-2	41.4	41.4	6.5
	T25-DC	E80554-6	11/9/2000	2-3	30.8	30.8	6.5
T25-E	T25-EA	E80554-1	11/09/00	0-0.5	51	51	5.3
	TDUP-15/T25-EA	E80554-18	11/9/2000	0-0.5	86.6	86.6	6.1
	T25-EB	E80554-2	11/9/2000	1-2	11.8	11.8	5.7
	T25-EC	E80554-3	11/9/2000	2-3	10.9	10.9	6.3
T26-A	T26-AA	E80047-1	11/3/2000	0-0.5	117	117	6.7
	TDUP-10/T26-AA	E80047-4	11/3/2000	0-0.5	92	92	6.1
	T26-AB	E80047-2	11/3/2000	1-2	162	162	5.7
	T26-AC	E80047-3	11/3/2000	2-3	175	175	6
T26-B	T26-BA	E80048-4	11/3/2000	0-0.5	78.8	78.8	6.3
	T26-BB	E80048-5	11/3/2000	1-2	199	199	6.3
	T26-BC	E80048-6	11/3/2000	2-3	164	164	6.4
T26-C	T26-CA	E80048-1	11/3/2000	0-0.5	8.6	8.6	6.8
	T26-CB	E80048-2	11/3/2000	1-2	8.4	8.4	6.3
	T26-CC	E80048-3	11/3/2000	2-3	9.5	9.5	6.8
T26-D	T26-DA	E80047-8	11/3/2000	0-0.5	35.6	35.6	6.8
	T26-DB	E80047-9	11/3/2000	1-2	15	15	6.7
	T26-DC	E80047-10	11/3/2000	2-3	11.8	11.8	6.6
T26-E	T26-EA	E80047-5	11/3/2000	0-0.5	186	186	5.5
	T26-EB	E80047-6	11/3/2000	1-2	204	204	6.1
	T26-EC	E80047-7	11/3/2000	2-3	80.3	80.3	6.8
T27-A	T27-AA	E81103-18	11/17/2000	0-0.5	66	66	5.8
	T27-AB	E81103-19	11/17/2000	1-2	79.8	79.8	5.6
	T27-AC	E81103-20	11/17/2000	2-3	75.6	75.6	5.7
T27-B	T27-BA	E81103-15	11/17/2000	0-0.5	76.9	76.9	5.5
	T27-BB	E81103-16	11/17/2000	1-2	191	191	6.1
	T27-BC	E81103-17	11/17/2000	2-3	149	149	6.2
T27-C	T27-CA	E81103-11	11/17/2000	0-0.5	164	164	6
	TDUP-23/T27-CA	E81103-14	11/17/2000	0-0.5	154	154	6
	T27-CB	E81103-12	11/17/2000	1-2	116	116	6
	T27-CC	E81103-13	11/17/2000	2-3	11.3	11.3	6.5
T27-D	T27-DA	E81103-8	11/17/2000	0-0.5	46.3	46.3	5.4
	T27-DB	E81103-9	11/17/2000	1-2	204	204	6
	T27-DC	E81103-10	11/17/2000	2-3	117	117	5.6
	T27-EA	E81103-5	11/17/2000	0-0.5	64	64	5.8
T27-E	T27-EB	E81103-6	11/17/2000	1-2	136	136	5.6
	T27-EC	E81103-7	11/17/2000	2-3	180	180	5.5
T28-A	T28-AA	E80157-11	11/6/2000	0-0.5	93.5	93.5	5.7
	T28-AB	E80157-12	11/6/2000	1-2	153	153	5.9
	T28-AC	E80157-13	11/6/2000	2-3	238	238	5.8
T28-B	T28-BA	E80157-7	11/6/2000	0-0.5	85.5	85.5	5.9
	TDUP12/T28-BA	E80157-10	11/6/2000	0-0.5	98.3	98.3	5.9
	T28-BB	E80157-8	11/6/2000	1-2	141	141	6.1
	T28-BC	E80157-9	11/6/2000	2-3	159	159	6.3
T28-C	T28-CA	E80157-14	11/6/2000	0-0.5	24.4	24.4	6.6
	T28-CB	E80157-15	11/6/2000	1-2	14.1	14.1	6.8
	T28-CC	E80157-16	11/6/2000	2-3	8.1	8.1	5.2
T28-D	T28-DA	E80157-4	11/6/2000	0-0.5	185	185	5.5
	T28-DB	E80157-5	11/6/2000	1-2	150	150	5.8
	T28-DC	E80157-6	11/6/2000	2-3	162	162	6.3
T28-E	T28-EA	E80157-1	11/6/2000	0-0.5	102	102	8.3
	T28-EB	E80157-2	11/6/2000	1-2	38.5	38.5	5.6
	T28-EC	E80157-3	11/6/2000	2-3	9.5	9.5	5.4
T29-A	T29-AA	E80317-7	11/8/2000	0-0.5	241	241	6.1
	TDUP13/T29-AA	E80317-10	11/8/2000	0-0.5	122	122	5.8
	T29-AB	E80317-8	11/8/2000	1-2	142	142	5.9
	T29-AC	E80317-9	11/8/2000	2-3	199	199	6
T29-B	T29-BA	E80318-1	11/8/2000	0-0.5	90.4	90.4	6.2
	T29-BB	E80318-2	11/8/2000	1-2	101	101	5.9
	T29-BC	E80318-3	11/8/2000	2-3	134	134	6.1
T29-C	T29-CA	E80318-4	11/8/2000	0-0.5	75.3	75.3	6.3
	T29-CB	E80318-5	11/8/2000	1-2	20.3	20.3	6.3
	T29-CC	E80318-6	11/8/2000	2-3	10.6	10.6	6.3
T29-D	T29-DA	E80317-4	11/8/2000	0-0.5	117	117	5.8
	T29-DB	E80317-5	11/8/2000	1-2	190	190	5.6
	T29-DC	E80317-6	11/8/2000	2-3	206	206	6.1
T29-E	T29-EA	E80317-1	11/8/2000	0-0.5	149	149	5.9
	T29-EB	E80317-2	11/8/2000	1-2	159	159	5.7
	T29-EC	E80317-3	11/8/2000	2-3	283	283	5.7
T30-A	T30-AA	E80720-1	11/13/2000	0-0.5	111	111	5.7
	T30-AB	E80720-2	11/13/2000	1-2	227	227	6.1
	T30-AC	E80720-3	11/13/2000	2-3	202	202	6.3

TABLE 5-26
Martee Iron and Metal
 Sediment Sample Results: Lead

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Lead-Low Level (31 mg/kg)	Lead-High Level (250 mg/kg)	pH (su)
T30-B	T30-BA	E80720-4	11/13/2000	0-0.5	124	124	6
	TDUP-18/T30-BA	E80721-16	11/13/2000	0-0.5	126	126	4.8
	T30-BB	E80720-5	11/13/2000	1-2	116	116	6
	T30-BC	E80720-6	11/13/2000	2-3	116	116	5.8
T30-C	T30-CA	E80721-13	11/13/2000	0-0.5	131	131	6.7
	T30-CB	E80721-14	11/13/2000	1-2	11.7	11.7	6.6
	T30-CC	E80721-15	11/13/2000	2-3	14.6	14.6	5.2
	T30-DA	E80720-7	11/13/2000	0-0.5	202	202	6
T30-D	T30-DB	E80720-8	11/13/2000	1-2	201	201	5.7
	T30-DC	E80720-9	11/13/2000	2-3	204	204	6.2
	T30-EA	E80720-10	11/13/2000	0-0.5	254	254	5.7
	T30-EB	E80721-11	11/13/2000	1-2	198	198	5.7
T30-E	T30-EC	E80721-12	11/13/2000	2-3	17.5	17.5	5.6
	S1	E80721-1	11/13/2000	0-0.5	149	149	6.2
	S2	E80721-20	11/13/2000	0-0.5	339	339	5.6
	S3	E80721-19	11/13/2000	0-0.5	309	309	5.7
S4	S4	E80721-17	11/13/2000	0-0.5	154	154	5.8
	S5	E80721-18	11/13/2000	0-0.5	194	194	5.8
	S6	E80721-5	11/14/2000	0-0.5	61.7	61.7	5.9
	S7-A	E81170-19	11/20/2000	0-0.5	115	115	5.9
S7	SDUP-1/S7-A	E81104-18	11/20/2000	0-0.5	121	121	5.9
	S7-B	E81170-20	11/20/2000	1-2	202	202	6.1
	S7-C	E81104-17	11/20/2000	2-3	107	107	6.2
	S8-A	E81170-16	11/20/2000	0-0.5	269	269	5.6
S8	S8-B	E81170-17	11/20/2000	1-2	174	174	5.5
	S8-C	E81170-18	11/20/2000	2-3	50.1	50.1	5.9
	S9-A	E81170-13	11/20/2000	0-0.5	126	126	5.6
	S9-B	E81170-14	11/20/2000	1-2	151	151	5.6
S9	S9-C	E81170-15	11/20/2000	2-3	197	197	5.9
	S10-A	E81170-10	11/20/2000	0-0.5	108	108	5.9
	S10-B	E81170-11	11/20/2000	1-2	163	163	5.6
	S10-C	E81170-12	11/20/2000	2-3	195	195	6.3
S11	S11-A	E81170-7	11/20/2000	0-0.5	142	142	5.8
	S11-B	E81170-8	11/20/2000	1-2	177	177	6.1
	S11-C	E81170-9	11/20/2000	2-3	177	177	6.2
	S12-A	E81170-4	11/20/2000	0-0.5	235	235	5.8
S12	S12-B	E81170-5	11/20/2000	1-2	188	188	5.9
	S12-C	E81170-6	11/20/2000	2-3	242	242	6.2
	S13-A	E81170-1	11/20/2000	0-0.5	58.4	58.4	5.5
	S13-B	E81170-2	11/20/2000	1-2	137	137	5.3
S13	S13-C	E81170-3	11/20/2000	2-3	254	254	5.8
	S14	E81503-1	11/28/00	0-0.5	35.7	35.7	6.1

Notes:

-NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)

-Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98).

U = Not detected above the Contract Required Quantitation Limit (CRQL).

J = Estimated value.

NA = Not Available

* = Composite Sample

TABLE 5-27
Marine Iron and Metal
 Sediment Sample Results: PCBs

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Aroclor 1248			Aroclor 1254			Aroclor 1260			Total PCB			pH (m)	TOC
					Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria		
T1-A	T1-AA	E81104-1	11/16/2000	0-0.5	0.060 U	0.01	3.33	0.060 U	0.06	0.755	0.060 U	0.005	0.333	0.060 U	0.07	11.766	6	22.200
	T1-AB	E81104-2	11/16/2000	1-2	0.054 U	0.03	2.325	0.054 U	0.06	0.527	0.054 U	0.005	0.372	0.054 U	0.07	8.215	5.2	15.500
	T1-AC	E81104-3	11/16/2000	2-3	0.042 U	0.03	1.89	0.042 U	0.06	0.428	0.042 U	0.005	0.302	0.042 U	0.07	6.678	5	12.600
T1-B	T1-BA	E81104-4	11/16/2000	0-0.5	0.093 U	0.03	15	0.093 U	0.06	3.4	0.093 U	0.005	2.4	0.093 U	0.07	53	5.2	108.000
	T1-BB	E81104-5	11/16/2000	1-2	0.092 U	0.03	15	0.092 U	0.06	3.4	0.092 U	0.005	2.4	0.092 U	0.07	53	5.5	101.000
	T1-BC	E81104-6	11/16/2000	2-3	0.088 U	0.03	13.47	0.088 U	0.06	3.053	0.088 U	0.005	2.155	0.088 U	0.07	47.594	5.5	89.800
T1-C	T1-CB	E81104-12	11/16/2000	1-2	0.043 U	0.03	6.69	0.043 U	0.06	1.516	0.043 U	0.005	1.070	0.043 U	0.07	23.618	6.2	44.600
	T1-CC	E81104-13	11/16/2000	2-3	0.046 U	0.03	3.48	0.046 U	0.06	0.789	0.046 U	0.005	0.557	0.046 U	0.07	12.296	4.8	23.200
	T1-DA	E81104-7	11/16/2000	0-0.5	0.034 U	0.03	3.84	0.034 U	0.06	0.870	0.034 U	0.005	0.614	0.034 U	0.07	13.561	6.4	25.600
T1-D	T1-DB	E81104-8	11/16/2000	1-2	0.120 U	0.03	15	0.120 U	0.06	3.4	0.120 U	0.005	2.4	0.120 U	0.07	53	6.4	171.000
	T1-DC	E81104-9	11/16/2000	2-3	0.067 U	0.03	7.86	0.067 U	0.06	1.782	0.067 U	0.005	1.258	0.067 U	0.07	27.772	4.9	133.000
	T1-EA	E81104-14	11/16/2000	0-0.5	0.04 U	0.03	6.7	0.04 U	0.06	1.5	0.04 U	0.005	1.1	0.04 U	0.07	23.7	6	44.700
T1-E	T1-EB	E81104-15	11/16/2000	1-2	0.054 U	0.03	3.525	0.054 U	0.06	0.799	0.054 U	0.005	0.564	0.054 U	0.07	12.455	5.8	23.500
	T1-EC	E81104-16	11/16/2000	2-3	0.043 U	0.03	1.5	0.043 U	0.06	0.34	0.043 U	0.005	0.24	0.043 U	0.07	5.3	5.7	2.820
	T2-AA	E79744-13	10/31/2000	0-0.5	0.120 U	0.03	1.74	0.120 U	0.06	0.394	0.120 U	0.005	0.278	0.120 U	0.07	6.148	5.4	11.600
T2-A	T2-AB	E79744-14	10/31/2000	1-2	0.140 U	0.03	15	0.140 U	0.06	3.4	0.140 U	0.005	2.4	0.140 U	0.07	53	5.7	116.000
	T2-AC	E79744-15	10/31/2000	2-3	0.140 U	0.03	18.6	0.140 U	0.06	4.216	0.140 U	0.005	2.976	0.140 U	0.07	65.72	5.4	124.000
	T2-BA	E79745-10	10/31/2000	0-0.5	0.140 U	0.03	5.55	0.140 U	0.06	1.258	0.140 U	0.005	0.888	0.140 U	0.07	19.61	6.7	37.000
T2-B	T2-BB	E79745-11	10/31/2000	1-2	0.080 U	0.03	5.7	0.080 U	0.06	1.292	0.080 U	0.005	0.912	0.080 U	0.07	20.140	5.7	38.000
	T2-BC	E79744-12	10/31/2000	2-3	0.090 U	0.03	11.58	0.090 U	0.06	2.625	0.090 U	0.005	1.853	0.090 U	0.07	40.916	5.5	77.200
	T2-CA	E79745-7	10/31/2000	0-0.5	0.044 U	0.03	1.65	0.044 U	0.06	0.374	0.044 U	0.005	0.264	0.044 U	0.07	5.83	6.3	11.000
T2-C	T2-CB	E79745-8	10/31/2000	1-2	0.058 U	0.03	2.7	0.058 U	0.06	0.612	0.058 U	0.005	0.432	0.058 U	0.07	9.54	6.3	18.000
	T2-CC	E79745-9	10/31/2000	2-3	0.056 U	0.03	3.75	0.056 U	0.06	0.85	0.056 U	0.005	0.6	0.056 U	0.07	13.25	5.6	25.000
	T2-DA	E79745-4	10/31/2000	0-0.5	0.067 U	0.03	2.1	0.067 U	0.06	0.476	0.067 U	0.005	0.336	0.067 U	0.07	7.42	5.3	14.000
T2-D	T2-DB	E79745-5	10/31/2000	1-2	0.072 U	0.03	6	0.072 U	0.06	1.36	0.072 U	0.005	0.96	0.072 U	0.07	21.2	5.6	40.000
	T2-DC	E79745-6	10/31/2000	2-3	0.053 U	0.03	1.95	0.053 U	0.06	0.442	0.053 U	0.005	0.312	0.053 U	0.07	6.89	5.5	13.000
	T2-EA	E79745-1	10/31/2000	0-0.5	0.1 U	0.03	6.5	0.1 U	0.06	1.5	0.1 U	0.005	1.0	0.1 U	0.07	22.8	5.8	43.000
T2-E	T2-EB	E79745-2	10/31/2000	1-2	0.084 U	0.03	4.95	0.084 U	0.06	1.122	0.084 U	0.005	0.792	0.084 U	0.07	17.49	5.6	33.000
	T2-EC	E79745-3	10/31/2000	2-3	0.058 U	0.03	2.55	0.058 U	0.06	0.578	0.058 U	0.005	0.408	0.058 U	0.07	9.01	5.5	17.000
	T3-AA	E80832-1	11/15/2000	0-0.5	0.150 U	0.03	12.405	0.150 U	0.06	2.812	0.150 U	0.005	1.985	0.150 U	0.07	43.831	7.5	82.700
T3-A	T3-AB	E80832-2	11/15/2000	1-2	0.074 U	0.03	8.505	0.074 U	0.06	1.928	0.074 U	0.005	1.361	0.074 U	0.07	30.051	6	56.700
	T3-AC	E80832-3	11/15/2000	2-3	0.078 U	0.03	9.15	0.078 U	0.06	2.074	0.078 U	0.005	1.464	0.078 U	0.07	32.330	6	61.000
	T3-BA	E80832-4	11/15/2000	0-0.5	0.080 U	0.03	7.665	0.080 U	0.06	1.724	0.080 U	0.005	1.217	0.080 U	0.07	26.871	6.3	50.700
T3-B	T3-BB	E80832-5	11/15/2000	1-2	0.072 U	0.03	7.11	0.072 U	0.06	1.617	0.072 U	0.005	1.138	0.072 U	0.07	25.122	5.8	47.400
	T3-BC	E80832-6	11/15/2000	2-3	0.073 U	0.03	8.025	0.073 U	0.06	1.819	0.073 U	0.005	1.284	0.073 U	0.07	28.355	6.3	53.500
	T3-CA	E80833-8	11/15/2000	0-0.5	0.072 U	0.03	8.655	0.072 U	0.06	1.962	0.072 U	0.005	1.385	0.072 U	0.07	30.581	5.8	57.700
T3-C	T3-CB	E80833-9	11/15/2000	1-2	0.061 U	0.03	8.925	0.061 U	0.06	2.023	0.061 U	0.005	1.428	0.061 U	0.07	31.535	6.4	59.500
	T3-CC	E80833-10	11/15/2000	2-3	0.087 U	0.03	10.98	0.087 U	0.06	2.489	0.087 U	0.005	1.757	0.087 U	0.07	38.796	5.6	73.200
	T3-DA	E80831-5	11/15/2000	0-0.5	0.080 U	0.03	7.8	0.080 U	0.06	1.768	0.080 U	0.005	1.248	0.080 U	0.07	27.56	6.2	52.000
T3-D	T3-DB	E80831-6	11/15/2000	1-2	0.072 U	0.03	7.005	0.072 U	0.06	1.588	0.072 U	0.005	1.121	0.072 U	0.07	24.751	5.3	46.700
	T3-DC	E80831-7	11/15/2000	2-3	0.062 U	0.03	7.41	0.062 U	0.06	1.680	0.062 U	0.005	1.186	0.062 U	0.07	26.182	6	49.400
	T3-EA	E80832-7	11/15/2000	0-0.5	0.063 U	0.03	6.2	0.063 U	0.06	1.4	0.063 U	0.005	1.0	0.063 U	0.07	21.8	5.4	41.200
T3-E	T3-EB	E80832-8	11/15/2000	1-2	0.076 U	0.03	6.93	0.076 U	0.06	1.8	0.076 U	0.005	1.2	0.076 U	0.07	27.3	6.7	51.500
	T3-EC	E80832-9	11/15/2000	2-3	0.079 U	0.03	7.71	0.079 U	0.06	1.748	0.079 U	0.005	1.234	0.079 U	0.07	27.242	5.9	51.400
	T4-CA	E79744-16	10/30/2000	0-0.5	0.059 U	0.03	3.59	0.059 U	0.06	0.81	0.059 U	0.005	0.57	0.059 U	0.07	12.67	6.5	27.900
T4-C	T4-CB	E79744-17	10/30/2000	1-2	0.066 U	0.03	2.175	0.066 U	0.06	0.493	0.066 U	0.005	0.348	0.066 U	0.07	7.685	6.3	14.500
	T4-CC	E79744-18	10/30/2000	2-3	0.076 U	0.03	10.275	0.076 U	0.06	2.329	0.076 U	0.005	1.644	0.076 U	0.07	36.305	6.1	68.500
	T4-DA	E79744-20	10/30/2000	0-0.5	0.140 U	0.03	12.765	0.140 U	0.06	2.893	0.140 U	0.005	2.042	0.140 U	0.07	45.103	5.3	85.100
T4-D	T4-DB	E79744-21	10/30/2000	1-2	0.140 U	0.03	11.585	0.140 U	0.06	2.581	0.140 U	0.005	1.822	0.140 U	0.07	40.227	5.4	75.900
	T4-DC	E79744-22	10/30/2000	2-3	0.088 U	0.03	8.625	0.088 U	0.06	1.955	0.088 U	0.005	1.38	0.088 U	0.07	30.475	5.6	57.500
	T4-EA	E79744-1	10/30/2000	0-0.5	0.053 U	0.03	11.1	0.053 U	0.06	2.5	0.053 U	0.005	1.8	0.053 U	0.07	39.3	6.2	74.200
T4-E	T4-EB	E79744-2	10/30/2000	1-2	0.180 U	0.03	2.355	0.180 U	0.06	0.534	0.180 U	0.005	0.377	0.180 U	0.07	6.321	4.9	15.700
	T4-EC	E79744-3	10/30/2000	2-3	0.120 U	0.03	14.085	0.120 U	0.06	3.193	0.120 U	0.005	2.254	0.120 U	0.07	49.767	5.5	93.900
	T5-CA	E79743-8	10/31/2000	0-0.5	0.068 U	0.03	3.945	0.068 U	0.06	0.894	0.068 U	0.005	0.631	0.068 U	0.07	13.939	6.9	26.300
T5-C	T5-CB	E79743-9	10/31/2000	1-2	0.076 U	0.03	8.055	0.076 U	0.06	1.826	0.076 U	0.005	1.289	0.076 U	0.07	28.461	5.9	53.700
	T5-CC	E79743-10	10/31/2000	2-3	0.066 U	0.03	6.39	0.066 U	0.06	1.428	0.066 U	0.005	1.022	0.066 U	0.07	22.578	5.8	42.60

TABLE 5-27
Matrix Iron and Metal
Sediment Sample Results: PCBs

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Aroclor 1248			Aroclor 1254			Aroclor 1260			Total PCB			pH (m)	TOC
					Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria		
T9-A	T9-AA	E80555-7	11/10/2000	0-0.5	0.069 U	0.03	7.86	0.069 U	0.06	1.78	0.069 U	0.005	1.26	0.069 U	0.07	27.77	5.6	52.400
	TDUP-171 T9-AA	E80555-7	11/10/2000	0-0.5	0.1 U	0.03	9.51	0.1 U	0.06	2.16	0.1 U	0.005	1.52	0.1 U	0.07	33.60	5.6	63.400
	T9-AB	E80555-8	11/10/2000	1-2	0.076 U	0.03	8.55	0.076 U	0.06	1.938	0.076 U	0.005	1.368	0.076 U	0.07	30.21	5.7	57.000
	T9-AC	E80555-9	11/10/2000	2-3	0.70 U	0.03	8.175	0.70 U	0.06	1.853	0.70 U	0.005	1.308	0.70 U	0.07	28.885	5.6	54.500
T9-B	T9-BA	E80555-11	11/10/2000	0-0.5	0.077 U	0.03	7.68	0.077 U	0.06	1.741	0.077 U	0.005	1.229	0.077 U	0.07	27.136	5.6	51.200
	T9-BB	E80555-12	11/10/2000	1-2	0.079 U	0.03	7.47	0.079 U	0.06	1.693	0.079 U	0.005	1.195	0.079 U	0.07	26.394	6.2	49.800
	T9-BC	E80555-13	11/10/2000	2-3	0.079 U	0.03	7.74	0.079 U	0.06	1.754	0.079 U	0.005	1.238	0.079 U	0.07	27.348	5.8	51.600
	T9-CA	E80555-14	11/10/2000	0-0.5	0.076 U	0.03	13.17	0.076 U	0.06	2.985	0.076 U	0.005	2.107	0.076 U	0.07	46.534	6	87.800
T9-C	T9-CB	E80555-15	11/10/2000	1-2	0.069 U	0.03	7.695	0.069 U	0.06	1.744	0.069 U	0.005	1.231	0.069 U	0.07	27.189	6.4	51.300
	T9-CC	E80555-16	11/10/2000	2-3	0.069 U	0.03	8.01	0.069 U	0.06	1.816	0.069 U	0.005	1.282	0.069 U	0.07	28.202	6.5	53.400
	T9-DA	E80555-17	11/10/2000	0-0.5	0.081 U	0.03	12.63	0.081 U	0.06	2.863	0.081 U	0.005	2.021	0.081 U	0.07	44.626	6.7	84.200
	T9-DB	E80555-18	11/10/2000	1-2	0.072 U	0.03	13.455	0.072 U	0.06	3.050	0.072 U	0.005	2.153	0.072 U	0.07	47.541	6.2	89.700
T9-D	T9-DC	E80555-19	11/10/2000	2-3	0.072 U	0.03	10.125	0.072 U	0.06	2.295	0.072 U	0.005	1.62	0.072 U	0.07	35.775	6.2	67.500
	T9-EA	E80555-14	11/10/2000	0-0.5	0.079 U	0.03	15.0	0.079 U	0.06	3.435	0.079 U	0.005	2.44	0.079 U	0.07	53.0	6.1	104.000
	T9-EB	E80555-15	11/10/2000	1-2	0.089 U	0.03	11.91	0.089 U	0.06	2.700	0.089 U	0.005	1.906	0.089 U	0.07	42.082	5.8	79.400
	T9-EC	E80555-16	11/10/2000	2-3	0.062 U	0.03	9.48	0.062 U	0.06	2.149	0.062 U	0.005	1.517	0.062 U	0.07	33.496	5.7	63.200
T11-A	T11-AA	E79555-11	10/27/2000	0-0.5	0.480 U	0.03	8.895	0.480 U	0.06	2.016	0.480 U	0.005	1.423	0.480 U	0.07	31.429	5.3	59.300
	T11-AB	E79555-12	10/27/2000	1-2	0.370 U	0.03	7.62	0.370 U	0.06	1.727	0.370 U	0.005	1.219	0.370 U	0.07	26.924	5.6	50.800
	T11-AC	E79555-13	10/27/2000	2-3	0.410 U	0.03	8.655	0.410 U	0.06	1.962	0.410 U	0.005	1.385	0.410 U	0.07	30.581	5.6	57.700
	T11-BA	E79555-14	10/27/2000	0-0.5	0.510 U	0.03	7.995	0.510 U	0.06	1.812	0.510 U	0.005	1.279	0.510 U	0.07	28.249	5.9	53.300
T11-B	T11-BB	E79555-15	10/27/2000	1-2	0.410 U	0.03	7.35	0.410 U	0.06	1.666	0.410 U	0.005	1.176	0.410 U	0.07	25.970	5.6	49.000
	T11-BC	E79555-16	10/27/2000	2-3	0.430 U	0.03	7.5	0.430 U	0.06	1.700	0.430 U	0.005	1.2	0.430 U	0.07	26.500	5.5	50.000
	T11-CA	E79555-17	10/27/2000	0-0.5	0.480 U	0.03	8.295	0.480 U	0.06	1.880	0.480 U	0.005	1.327	0.480 U	0.07	29.309	5.6	55.300
	T11-CB	E79555-18	10/27/2000	1-2	0.440 U	0.03	7.965	0.440 U	0.06	1.805	0.440 U	0.005	1.274	0.440 U	0.07	28.143	5.8	53.100
T11-C	T11-CC	E79555-19	10/27/2000	2-3	0.460 U	0.03	8.955	0.460 U	0.06	2.030	0.460 U	0.005	1.433	0.460 U	0.07	31.641	5.7	59.700
	T11-DA	E79555-20	10/27/2000	0-0.5	0.64 U	0.03	8.82	0.64 U	0.06	2.00	0.64 U	0.005	1.41	0.64 U	0.07	31.16	5.8	58.800
	TDUP-171 T11-DA	E79555-21	10/27/2000	0-0.5	0.68 U	0.03	10.26	0.68 U	0.06	2.33	0.68 U	0.005	1.64	0.68 U	0.07	36.25	5.8	68.400
	T11-DB	E79555-22	10/27/2000	1-2	0.480 U	0.03	9	0.480 U	0.06	2.040	0.480 U	0.005	1.44	0.480 U	0.07	31.800	6.1	60.000
T11-D	T11-DC	E79555-23	10/27/2000	2-3	0.400 U	0.03	9.18	0.400 U	0.06	2.081	0.400 U	0.005	1.469	0.400 U	0.07	32.436	5.7	61.200
	T11-EA	E79555-24	10/27/2000	0-0.5	0.58 U	0.03	9.9	0.58 U	0.06	2.2	0.58 U	0.005	1.6	0.58 U	0.07	34.8	5.6	65.700
	T11-EB	E79555-25	10/27/2000	1-2	0.400 U	0.03	6.42	0.400 U	0.06	1.455	0.400 U	0.005	1.027	0.400 U	0.07	22.684	5.9	42.800
	T11-EC	E79555-26	10/27/2000	2-3	0.380 U	0.03	14.04	0.380 U	0.06	3.182	0.380 U	0.005	2.246	0.380 U	0.07	49.088	6.2	93.600
T13-A	T13-AA	E79453-3	10/25/2000	0-0.5	0.644 U	0.03	1.5	0.644 U	0.06	0.340	0.644 U	0.005	0.24	0.644 U	0.07	5.300	5.6	6.430
	T13-AB	E79453-4	10/25/2000	1-2	0.037 U	0.03	4.905	0.037 U	0.06	1.112	0.037 U	0.005	0.785	0.037 U	0.07	17.331	5.6	32.700
	T13-AC	E79453-5	10/25/2000	2-3	0.034 U	0.03	6.66	0.034 U	0.06	1.510	0.034 U	0.005	1.066	0.034 U	0.07	23.572	5.7	44.400
	T13-BA	E79453-21	10/25/2000	0-0.5	0.050 U	0.03	2.46	0.050 U	0.06	0.558	0.050 U	0.005	0.394	0.050 U	0.07	8.692	5.8	16.400
T13-B	T13-BB	E79453-22	10/25/2000	1-2	0.034 U	0.03	3.42	0.034 U	0.06	0.775	0.034 U	0.005	0.547	0.034 U	0.07	12.054	5.7	22.800
	T13-BC	E79453-23	10/25/2000	2-3	0.037 U	0.03	3.525	0.037 U	0.06	0.799	0.037 U	0.005	0.564	0.037 U	0.07	12.455	5.4	23.500
	T13-CA	E79453-24	10/25/2000	0-0.5	0.057 U	0.03	5.82	0.057 U	0.06	1.319	0.057 U	0.005	0.931	0.057 U	0.07	20.564	6.5	38.800
	T13-CB	E79453-25	10/25/2000	1-2	0.056 U	0.03	4.05	0.056 U	0.06	0.918	0.056 U	0.005	0.648	0.056 U	0.07	14.31	6.4	27.000
T13-C	T13-CC	E79453-26	10/25/2000	2-3	0.056 U	0.03	4.05	0.056 U	0.06	1.367	0.056 U	0.005	0.965	0.056 U	0.07	21.306	6.3	40.200
	T13-DA	E79453-27	10/25/2000	0-0.5	0.061 U	0.03	13.2	0.061 U	0.06	2.992	0.061 U	0.005	2.112	0.061 U	0.07	46.64	5.8	88.000
	T13-DB	E79453-28	10/25/2000	1-2	0.062 U	0.03	6.69	0.062 U	0.06	1.516	0.062 U	0.005	1.070	0.062 U	0.07	23.638	6.1	44.600
	T13-DC	E79453-29	10/25/2000	2-3	0.047 U	0.03	1.5	0.047 U	0.06	0.34	0.047 U	0.005	0.24	0.047 U	0.07	5.3	6.4	8.500
T13-D	T13-EA	E79453-30	10/25/2000	0-0.5	0.065 U	0.03	10.8	0.065 U	0.06	2.4	0.065 U	0.005	1.7	0.065 U	0.07	36.1	5.8	71.900
	TDUP-171 T13-EA	E79453-31	10/25/2000	0-0.5	0.06 U	0.03	3.9	0.06 U	0.06	0.9	0.06 U	0.005	0.6	0.06 U	0.07	13.7	6.6	25.800
	T13-EB	E79453-32	10/25/2000	1-2	0.060 U	0.03	6.6	0.060 U	0.06	1.496	0.060 U	0.005	1.056	0.060 U	0.07	23.320	6	44.000
	T13-EC	E79453-33	10/25/2000	2-3	0.063 U	0.03	8.825	0.063 U	0.06	1.547	0.063 U	0.005	1.092	0.063 U	0.07	24.115	6.2	45.500
T14-A	T14-AA	E78963-7	10/18/2000	0-0.5	0.088 U	0.03	8.175	0.088 U	0.06	1.853	0.088 U	0.005	1.308	0.088 U	0.07	28.885	5.8	54.500
	T14-AB	E78963-8	10/18/2000	1-2	0.080 U	0.03	8.085	0.080 U	0.06	1.833	0.080 U	0.005	1.294	0.080 U	0.07	28.567	5.7	53.900
	T14-AC	E78963-9	10/18/2000	2-3	0.070 U	0.03	8.73	0.070 U	0.06	1.979	0.070 U	0.005	1.397	0.070 U	0.07	30.846	5.8	58.200
	T14-BA	E78963-10	10/18/2000	0-0.5	0.120 U	0.03	8.1	0.120 U	0.06	1.836	0.120 U	0.005	1.296	0.120 U	0.07	25.62	6.7	54.000
T14-B	T14-BB	E78963-11	10/18/2000	1-2	0.093 U	0.03	8.655	0.093 U	0.06	1.962	0.093 U	0.005	1.385	0.093 U	0.07	30.581	6.2	57.700
	T14-BC	E78963-12	10/18/2000	2-3	0.089 U	0.03	9.165	0.089 U	0.06	2.077	0.089 U	0.005	1.466	0.089 U	0.07	32.383	6	61.100
	T14-CA	E78964-4	10/18/2000	0-0.5	0.050 U	0.03	1.56	0.050 U	0.06	0.354	0.050 U	0.005	0.250	0.050 U	0.07	5.512	6.2	10.400
	T14-CB	E78964-5	10/18/2000															

TABLE 5-27
 Marine Iron and Metal
 Sediment Sample Results: PCBs

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Aroclor 1248			Aroclor 1254			Aroclor 1260			Total PCB			pH (su)	TOC
					Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria		
T17-A	T17-AA	E79931-16	11/2/2000	0-0.5	0.140 U	0.03	13.32	0.140 U	0.06	3.019	0.140 U	0.005	2.131	0.140 U	0.07	47.064	5.8	88,800
	T17-AB	E79931-17	11/2/2000	1-2	0.065 U	0.03	15	0.065 U	0.06	3.4	0.065 U	0.005	2.4	0.065 U	0.07	53	6.1	120,000
	T17-AC	E79931-18	11/2/2000	2-3	0.740 U	0.03	15	0.740 U	0.06	3.4	0.740 U	0.005	2.4	0.740 U	0.07	53	6.5	1,020,000
T17-B	T17-BA	E79931-13	11/2/2000	0-0.5	0.068 U	0.03	7.995	0.068 U	0.06	1.812	0.068 U	0.005	1.279	0.068 U	0.07	28.249	6	53,300
T17-B	T17-BB	E79931-14	11/2/2000	1-2	0.390 U	0.03	15	0.390 U	0.06	3.4	0.390 U	0.005	2.4	0.390 U	0.07	53	5.9	304,000
	T17-BC	E79931-15	11/2/2000	2-3	0.064 U	0.03	9.675	0.064 U	0.06	2.191	0.064 U	0.005	1.548	0.064 U	0.07	34.185	5.9	64,500
	T17-C	T17-CA	E79932-6	11/2/2000	0-0.5	0.051 U	0.03	1.5	0.051 U	0.06	0.34	0.051 U	0.005	0.24	0.051 U	0.07	5.3	6.4
T17-C	T17-CB	E79932-7	11/2/2000	1-2	0.052 U	0.03	1.5	0.052 U	0.06	0.34	0.052 U	0.005	0.24	0.052 U	0.07	5.3	6.5	8,100
	T17-CC	E79932-8	11/2/2000	2-3	0.053 U	0.03	1.65	0.053 U	0.06	0.374	0.053 U	0.005	0.264	0.053 U	0.07	5.83	5.9	11,000
	T17-DA	E79932-9	11/2/2000	0-0.5	0.094 U	0.03	4.05	0.094 U	0.06	0.92	0.094 U	0.005	0.63	0.094 U	0.07	14.31	6.1	27,000
T17-D	TDUP-9/T17-DA	E79932-10	11/2/2000	0-0.5	0.084 U	0.03	4.50	0.084 U	0.06	1.02	0.084 U	0.005	0.72	0.084 U	0.07	15.90	6.1	30,000
	T17-DB	E79931-11	11/2/2000	1-2	0.076 U	0.03	10.335	0.076 U	0.06	2.343	0.076 U	0.005	1.654	0.076 U	0.07	36.517	6	68,900
	T17-DC	E79931-12	11/2/2000	2-3	0.160 U	0.03	15	0.160 U	0.06	3.4	0.160 U	0.005	2.4	0.160 U	0.07	53	5.8	219,000
T17-E	T17-EA	E79931-7	11/1/2000	0-0.5	0.05 U	0.03	8.1	0.05 U	0.06	1.8	0.05 U	0.005	1.3	0.05 U	0.07	28.7	6.4	54,200
	T17-EB	E79931-8	11/1/2000	1-2	0.048 U	0.03	4.62	0.048 U	0.06	1.047	0.048 U	0.005	0.739	0.048 U	0.07	16.374	6.5	30,800
	T17-EC	E79931-9	11/1/2000	2-3	0.040 U	0.03	1.5	0.040 U	0.06	0.34	0.040 U	0.005	0.24	0.040 U	0.07	5.3	6.3	6,410
T18-A	T18-AA	E80833-1	11/15/2000	0-0.5	0.070 U	0.03	9.255	0.070 U	0.06	2.098	0.070 U	0.005	1.481	0.070 U	0.07	32.701	5.9	61,700
	T18-AB	E80833-2	11/15/2000	1-2	0.067 U	0.03	9.705	0.067 U	0.06	2.200	0.067 U	0.005	1.553	0.067 U	0.07	34.291	6	64,700
	T18-AC	E80833-3	11/15/2000	2-3	0.046 U	0.03	1.5	0.046 U	0.06	0.34	0.046 U	0.005	0.24	0.046 U	0.07	5.3	7.1	5,980
T18-B	T18-BA	E80833-4	11/15/2000	0-0.5	0.034 U	0.03	2.73	0.034 U	0.06	0.619	0.034 U	0.005	0.437	0.034 U	0.07	9.646	6.7	18,200
	TDUP-19/T18-BA	E80833-7	11/15/2000	0-0.5	0.095 U	0.03	9.03	0.095 U	0.06	2.047	0.095 U	0.005	1.445	0.095 U	0.07	31.906	7	60,200
	T18-BB	E80833-5	11/15/2000	1-2	0.044 U	0.03	4.215	0.044 U	0.06	0.955	0.044 U	0.005	0.674	0.044 U	0.07	14.893	6.2	28,100
T18-C	T18-BC	E80833-6	11/15/2000	2-3	0.048 U	0.03	1.5	0.048 U	0.06	0.34	0.048 U	0.005	0.24	0.048 U	0.07	5.3	6.9	4,190
	T18-CA	E80720-12	11/13/2000	0-0.5	0.054 U	0.03	4.08	0.054 U	0.06	0.925	0.054 U	0.005	0.653	0.054 U	0.07	14.416	6.6	27,200
	T18-CB	E80720-13	11/13/2000	1-2	0.048 U	0.03	2.13	0.048 U	0.06	0.483	0.048 U	0.005	0.341	0.048 U	0.07	7.526	6.7	14,200
T18-D	T18-CC	E80720-14	11/13/2000	2-3	0.059 U	0.03	5.325	0.059 U	0.06	1.207	0.059 U	0.005	0.852	0.059 U	0.07	18.815	6	35,500
	T18-DA	E80721-9	11/14/2000	0-0.5	0.052 U	0.03	3.945	0.052 U	0.06	0.894	0.052 U	0.005	0.611	0.052 U	0.07	13.939	6.6	26,300
	T18-DB	E80721-10	11/14/2000	1-2	0.096 U	0.03	2.955	0.096 U	0.06	0.670	0.096 U	0.005	0.473	0.096 U	0.07	10.441	6.7	19,700
T18-D	T18-DC	E80721-11	11/14/2000	2-3	0.052 U	0.03	5.64	0.052 U	0.06	1.278	0.052 U	0.005	0.902	0.052 U	0.07	19.928	6.7	37,600
	T18-EA	E80721-6	11/14/2000	0-0.5	0.074 U	0.03	13.5	0.074 U	0.06	3.1	0.074 U	0.005	2.2	0.074 U	0.07	47.8	5.9	90,200
	T18-EB	E80721-7	11/14/2000	1-2	0.042 U	0.03	12.555	0.042 U	0.06	2.846	0.042 U	0.005	2.009	0.042 U	0.07	44.361	7.1	83,700
T18-E	T18-EC	E80721-8	11/14/2000	2-3	0.081 U	0.03	14.27	0.081 U	0.06	5.223	0.081 U	0.005	2.275	0.081 U	0.07	53.006	6	94,800
	T19-AA	E79931-4	11/1/2000	0-0.5	0.076 U	0.03	4.815	0.076 U	0.06	1.091	0.076 U	0.005	0.770	0.076 U	0.07	17.013	6.3	32,100
	T19-AB	E79931-5	11/1/2000	1-2	0.063 U	0.03	11.19	0.063 U	0.06	2.536	0.063 U	0.005	1.790	0.063 U	0.07	39.518	6.1	74,600
T19-B	T19-AC	E79931-6	11/1/2000	2-3	0.066 U	0.03	10.89	0.066 U	0.06	2.468	0.066 U	0.005	1.742	0.066 U	0.07	38.478	5.9	72,600
	T19-BA	E79931-1	11/1/2000	0-0.5	0.090 U	0.03	3.075	0.090 U	0.06	0.697	0.090 U	0.005	0.492	0.090 U	0.07	10.865	6.6	20,500
	T19-BB	E79931-2	11/1/2000	1-2	0.047 U	0.03	3.945	0.047 U	0.06	0.894	0.047 U	0.005	0.631	0.047 U	0.07	13.919	6.7	26,300
T19-B	T19-BC	E79931-3	11/1/2000	2-3	0.053 U	0.03	1.5	0.053 U	0.06	0.34	0.053 U	0.005	0.24	0.053 U	0.07	5.3	6.3	7,620
	T19-CA	E79933-1	11/1/2000	0-0.5	0.110 U	0.03	15	0.110 U	0.06	3.4	0.110 U	0.005	2.4	0.110 U	0.07	53	7	153,000
	T19-CB	E79933-2	11/1/2000	1-2	0.130 U	0.03	15	0.130 U	0.06	3.4	0.130 U	0.005	2.4	0.130 U	0.07	53	6.7	130,000
T19-C	T19-CC	E79933-3	11/1/2000	2-3	0.180 U	0.03	15	0.180 U	0.06	3.4	0.180 U	0.005	2.4	0.180 U	0.07	53	6.5	240,000
	T19-DA	E79933-8	11/1/2000	0-0.5	0.050 U	0.03	6.33	0.050 U	0.06	1.435	0.050 U	0.005	1.013	0.050 U	0.07	22.366	6.6	42,200
	T19-DB	E79933-9	11/1/2000	1-2	0.066 U	0.03	8.58	0.066 U	0.06	1.945	0.066 U	0.005	1.373	0.066 U	0.07	30.316	6.6	57,200
T19-D	T19-DC	E79933-10	11/1/2000	2-3	0.110 U	0.03	6.555	0.110 U	0.06	1.486	0.110 U	0.005	1.049	0.110 U	0.07	23.161	5.9	43,700
	T19-EA	E79933-4	11/1/2000	0-0.5	0.088 U	0.03	9.0	0.088 U	0.06	2.1	0.088 U	0.005	1.4	0.088 U	0.07	12.0	6.2	60,300
	TDUP-7/T19-EA	E79933-7	11/1/2000	0-0.5	0.068 U	0.03	1.5	0.068 U	0.06	0.3	0.068 U	0.005	0.2	0.068 U	0.07	5.4	6.2	10,100
T19-E	T19-EB	E79933-5	11/1/2000	1-2	0.045 U	0.03	1.5	0.045 U	0.06	0.34	0.045 U	0.005	0.24	0.045 U	0.07	5.3	6.7	5,660
	T19-EC	E79933-6	11/1/2000	2-3	0.046 U	0.03	1.5	0.046 U	0.06	0.34	0.046 U	0.005	0.24	0.046 U	0.07	5.3	6.9	6,050
	T20-AA	E79931-10	11/2/2000	0-0.5	0.06 U	0.03	6.66	0.06 U	0.06	1.51	0.06 U	0.005	1.07	0.06 U	0.07	23.53	5.8	44,400
T20-A	T20-AB	E79932-1	11/2/2000	1-2	0.130 U	0.03	5.25	0.130 U	0.06	1.19	0.130 U	0.005	0.840	0.130 U	0.07	18.550	6.2	35,000
	T20-AC	E79932-2	11/2/2000	2-3	0.120 U	0.03	5.250	0.120 U	0.06	1.19	0.120 U	0.005	0.84	0.120 U	0.07	18.550	6.1	35,000
	T20-BA	E79932-3	11/2/2000	0-0.5	0.079 U	0.03	4.05	0.079 U	0.06	0.918	0.079 U	0.005	0.648	0.079 U	0.07	14.31	6.6	27,000
T20-B	T20-BB	E79932-4	11/2/2000	1-2	0.060 U	0.03	3.15	0.060 U	0.06	0.714	0.060 U	0.005	0.504	0.060 U	0.07	11.13	6	21,000
	T20-BC	E79932-5	11/2/2000	2-3	0.080 U	0.03	4.05	0.080 U	0.06	0.918	0.080 U	0.005	0.648	0.080 U	0.07	14.31	6.2	27,000
	T20-CA	E79932-17	11/2/2000	0-0.5	0.092 U	0.03	9.6	0.092 U	0.06	2.176	0.092 U	0.005	1.536	0.092 U	0.07	33.92	6.1	64,000
T20-C	TDUP-8/T20-CA	E79932-20	11/2/2000	0-0.5	0.170 U	0.03												

TABLE S-27
Manco Iron and Metal
 Sediment Sample Results: PCBs

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Aroclor 1248			Aroclor 1254			Aroclor 1260			Total PCB			pH (su)	TOC
					Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria		
T23-B	T23-BA	E81102-4	11/17/2000	0-0.5	0.046 U	0.03	1.5	0.046 U	0.06	0.34	0.046 U	0.005	0.24	0.046 U	0.07	5.3	7	4.650
	TDUP-22/T23-BA	E81102-7	11/17/2000	0-0.5	0.044 U	0.03	1.5	0.044 U	0.06	0.34	0.044 U	0.005	0.240	0.044 U	0.07	5.3	7.1	4.500
	T23-BB	E81102-5	11/17/2000	1-2	0.045 U	0.03	1.5	0.045 U	0.06	0.34	0.045 U	0.005	0.24	0.045 U	0.07	5.3	7	7.530
	T23-BC	E81102-6	11/17/2000	2-3	0.057 U	0.03	2.635	0.057 U	0.06	0.602	0.057 U	0.005	0.425	0.057 U	0.07	9.381	6.6	17.700
T23-C	T23-CA	E81102-8	11/17/2000	0-0.5	0.061 U	0.03	4.395	0.061 U	0.06	0.996	0.061 U	0.005	0.703	0.061 U	0.07	15.529	6.8	29.300
T23-C	T23-CB*	E81102-9	11/17/2000	0-3	0.062 U	0.03	4.41	0.062 U	0.06	1.000	0.062 U	0.005	0.706	0.062 U	0.07	15.582	5.6	29.400
T23-D	T23-DA	E81102-10	11/17/2000	0-0.5	0.044 U	0.03	5.085	0.044 U	0.06	1.153	0.044 U	0.005	0.814	0.044 U	0.07	17.967	6.8	33.900
	T23-DB	E81103-1	11/17/2000	1-2	0.056 U	0.03	2.04	0.056 U	0.06	0.462	0.056 U	0.005	0.326	0.056 U	0.07	7.708	6.3	13.600
	T23-DC	E81103-2	11/17/2000	2-3	0.057 U	0.03	4.5	0.057 U	0.06	1.02	0.057 U	0.005	0.72	0.057 U	0.07	15.9	6.1	30.000
	T23-EA	E81103-3	11/17/2000	0-0.5	0.071 U	0.03	8.3	0.071 U	0.06	1.9	0.071 U	0.005	1.3	0.071 U	0.07	29.5	5	55.600
T24-A	T23-EB	E81103-4	11/17/2000	1-2	0.067 U	0.03	8.01	0.067 U	0.06	1.816	0.067 U	0.005	1.282	0.067 U	0.07	28.302	5.8	53.400
	T24-AA	E80318-7	11/8/2000	0-0.5	0.057 U	0.03	3.735	0.057 U	0.06	0.847	0.057 U	0.005	0.598	0.057 U	0.07	13.197	6.4	24.900
	T24-AB	E80318-8	11/8/2000	1-2	0.051 U	0.03	2.445	0.051 U	0.06	0.554	0.051 U	0.005	0.391	0.051 U	0.07	8.639	6.3	16.300
	T24-AC	E80318-9	11/8/2000	2-3	0.056 U	0.03	1.98	0.056 U	0.06	0.449	0.056 U	0.005	0.317	0.056 U	0.07	6.996	6.1	13.200
T24-B	T24-BA	E80318-10	11/8/2000	0-0.5	0.052 U	0.03	1.95	0.052 U	0.06	0.442	0.052 U	0.005	0.312	0.052 U	0.07	6.89	5.8	13.000
	TDUP14/T24-BA	E80318-13	11/8/2000	0-0.5	0.058 U	0.03	5.19	0.058 U	0.06	1.176	0.058 U	0.005	0.830	0.058 U	0.07	18.338	6.1	34.600
	T24-BB	E80318-11	11/8/2000	1-2	0.054 U	0.03	2.97	0.054 U	0.06	0.673	0.054 U	0.005	0.475	0.054 U	0.07	10.494	5.8	19.800
	T24-BC	E80318-12	11/8/2000	2-3	0.057 U	0.03	3.495	0.057 U	0.06	0.792	0.057 U	0.005	0.559	0.057 U	0.07	12.569	5.5	23.300
T24-D	T24-DA	E80318-14	11/8/2000	0-0.5	0.070 U	0.03	9.6	0.070 U	0.06	2.176	0.070 U	0.005	1.536	0.070 U	0.07	33.92	6.2	64.000
	T24-DB	E80318-15	11/8/2000	1-2	0.068 U	0.03	13.26	0.068 U	0.06	3.006	0.068 U	0.005	2.122	0.068 U	0.07	46.852	6.3	88.400
	T24-DC	E80318-16	11/8/2000	2-3	0.063 U	0.03	10.47	0.063 U	0.06	2.373	0.063 U	0.005	1.675	0.063 U	0.07	36.994	6.5	69.800
	T24-EA	E80556-3	11/9/2000	0-0.5	0.064 U	0.03	4.4	0.064 U	0.06	1.0	0.064 U	0.005	0.7	0.064 U	0.07	15.6	5.4	29.500
T24-E	T24-EB	E80556-4	11/9/2000	1-2	0.040 U	0.03	3.96	0.040 U	0.06	0.598	0.040 U	0.005	0.634	0.040 U	0.07	13.992	5.2	26.400
	T24-EC	E80556-5	11/9/2000	2-3	0.040 U	0.03	1.5	0.040 U	0.06	0.34	0.040 U	0.005	0.24	0.040 U	0.07	5.3	5.2	9.590
	T25-AA	E80556-1	11/9/2000	0-0.5	0.030 U	0.03	1.5	0.030 U	0.06	0.34	0.030 U	0.005	0.24	0.030 U	0.07	5.3	6.1	8.330
	T25-AB	E80556-2	11/9/2000	1-2	0.046 U	0.03	1.5	0.046 U	0.06	0.34	0.046 U	0.005	0.24	0.046 U	0.07	5.3	5.8	2.160
T25-B	T25-BA	E80554-9	11/9/2000	0-0.5	0.047 U	0.03	1.5	0.047 U	0.06	0.34	0.047 U	0.005	0.24	0.047 U	0.07	5.3	6.9	4.660
	T25-BB*	E80554-10	11/9/2000	0-3	0.045 U	0.03	1.5	0.045 U	0.06	0.34	0.045 U	0.005	0.24	0.045 U	0.07	5.3	6.9	2.570
	T25-CA	E80554-8	11/9/2000	0-0.5	0.052 U	0.03	3.75	0.052 U	0.06	0.85	0.052 U	0.005	0.6	0.052 U	0.07	13.25	6.7	25.000
	T25-CB*	E80554-7	11/9/2000	0-3	0.058 U	0.03	1.56	0.058 U	0.06	0.354	0.058 U	0.005	0.250	0.058 U	0.07	5.512	6.4	10.400
T25-D	T25-DA	E80554-4	11/9/2000	0-0.5	0.064 U	0.03	4.355	0.064 U	0.06	0.983	0.064 U	0.005	0.694	0.064 U	0.07	15.317	6.6	28.900
	T25-DB	E80554-5	11/9/2000	1-2	0.054 U	0.03	4.515	0.054 U	0.06	1.023	0.054 U	0.005	0.722	0.054 U	0.07	15.953	6.5	30.100
	T25-DC	E80554-6	11/9/2000	2-3	0.056 U	0.03	4.125	0.056 U	0.06	0.935	0.056 U	0.005	0.66	0.056 U	0.07	14.575	6.5	27.500
	T25-EA	E80554-1	11/9/2000	0-0.5	0.049 U	0.03	1.7	0.049 U	0.06	0.4	0.049 U	0.005	0.3	0.049 U	0.07	6.1	5.3	11.500
T25-E	TDUP-15/T25-EA	E80554-18	11/9/2000	0-0.5	0.057 U	0.03	3.6	0.057 U	0.06	0.8	0.057 U	0.005	0.6	0.057 U	0.07	12.8	6.1	24.100
	T25-EB	E80554-2	11/9/2000	1-2	0.046 U	0.03	1.83	0.046 U	0.06	0.415	0.046 U	0.005	0.293	0.046 U	0.07	6.466	5.7	12.200
	T25-EC	E80554-3	11/9/2000	2-3	0.062 U	0.03	6.72	0.062 U	0.06	1.523	0.062 U	0.005	1.075	0.062 U	0.07	23.744	6.3	44.800
	T26-AA	E80047-1	11/3/2000	0-0.5	0.098 U	0.03	8.15	0.098 U	0.06	1.85	0.098 U	0.005	1.30	0.098 U	0.07	28.78	6.7	54.300
T26-A	TDUP-10/T26-AA	E80047-4	11/3/2000	0-0.5	0.092 U	0.03	7.28	0.092 U	0.06	1.65	0.092 U	0.005	1.16	0.092 U	0.07	25.71	6.1	48.500
	T26-AB	E80047-2	11/3/2000	1-2	0.065 U	0.03	10.605	0.065 U	0.06	2.404	0.065 U	0.005	1.697	0.065 U	0.07	37.471	5.7	70.700
	T26-AC	E80047-3	11/3/2000	2-3	0.068 U	0.03	11.43	0.068 U	0.06	2.591	0.068 U	0.005	1.829	0.068 U	0.07	40.586	6	76.200
	T26-BA	E80048-4	11/3/2000	0-0.5	0.077 U	0.03	15	0.077 U	0.06	3.4	0.077 U	0.005	2.4	0.077 U	0.07	53	6.3	403.000
T26-B	T26-BB	E80048-5	11/3/2000	1-2	0.071 U	0.03	15	0.071 U	0.06	3.4	0.071 U	0.005	2.4	0.071 U	0.07	53	6.3	400.000
	T26-BC	E80048-6	11/3/2000	2-3	0.064 U	0.03	15	0.064 U	0.06	3.4	0.064 U	0.005	2.4	0.064 U	0.07	53	6.4	296.000
	T26-CA	E80048-1	11/3/2000	0-0.5	0.058 U	0.03	15	0.058 U	0.06	3.4	0.058 U	0.005	2.4	0.058 U	0.07	53	6.8	256.000
	T26-CB	E80048-2	11/3/2000	1-2	0.064 U	0.03	15	0.064 U	0.06	3.4	0.064 U	0.005	2.4	0.064 U	0.07	53	6.3	212.000
T26-C	T26-CC	E80048-3	11/3/2000	2-3	0.048 U	0.03	15	0.048 U	0.06	3.4	0.048 U	0.005	2.4	0.048 U	0.07	53	6.8	446.000
	T26-DA	E80047-8	11/3/2000	0-0.5	0.058 U	0.03	1.5	0.058 U	0.06	0.34	0.058 U	0.005	0.24	0.058 U	0.07	5.3	6.8	7.950
	T26-DB	E80047-9	11/3/2000	1-2	0.050 U	0.03	1.5	0.050 U	0.06	0.34	0.050 U	0.005	0.24	0.050 U	0.07	5.3	6.7	9.390
	T26-DC	E80047-10	11/3/2000	2-3	0.049 U	0.03	1.92	0.049 U	0.06	0.435	0.049 U	0.005	0.307	0.049 U	0.07	6.784	6.6	12.800
T26-E	T26-EA	E80047-5	11/3/2000	0-0.5	0.089 U	0.03	9.5	0.089 U	0.06	2.2	0.089 U	0.005	1.5	0.089 U	0.07	33.7	5.5	65.500
	T26-EB	E80047-6	11/3/2000	1-2	0.072 U	0.03	8.775	0.072 U	0.06	1.989	0.072 U	0.005	1.404	0.072 U	0.07	31.005	6.1	58.500
	T26-EC	E80047-7	11/3/2000	2-3	0.070 U	0.03	13.92	0.070 U	0.06	3.155	0.070 U	0.005	2.227	0.070 U	0.07	49.184	6.8	92.800
	T27-AA	E81103-18	11/17/2000	0-0.5	0.071 U	0.03	7.23	0.071 U	0.06	1.659	0.071 U	0.005	1.157	0.071 U	0.07	25.546	5.8	48.200
T27-A	T27-AB	E81103-19	11/17/2000	1-2	0.056 U	0.03	7.185	0.056 U	0.06	1.629	0.056 U	0.005	1.150	0.056 U	0.07	25.387	5.6	47.900
	T27-AC	E81103-20	11/17/2000	2-3	0.066 U	0.03	11.13	0.066 U	0.06	2.523	0.066 U	0.005	1.781	0.066 U	0.07	39.526	5.7	74.200
	T27-BA	E81103-15	11/17/2000	0-0.5	0.065 U	0.03	9.495											

TABLE 5-27
Manco Iron and Metal
Sediment Sample Results: PCBs

Sample Location	Sample ID	Lab ID	Date	Depth (ft)	Aroclor 1248			Aroclor 1254			Aroclor 1260			Total PCB			pH (su)	TOC
					Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria	Result	Low Criteria	Severe Criteria		
T29-C	T29-CA	E80318-4	11/8/2000	0-0.5	0.053 U	0.03	3.075	0.053 U	0.06	0.697	0.053 U	0.005	0.492	0.053 U	0.07	10.865	6.3	20.500
	T29-CB	E80318-5	11/8/2000	1-2	0.047 U	0.03	1.5	0.047 U	0.06	0.34	0.047 U	0.005	0.24	0.047 U	0.07	5.3	6.3	7.660
	T29-CC	E80318-6	11/8/2000	2-3	0.053 U	0.03	2.415	0.053 U	0.06	0.547	0.053 U	0.005	0.386	0.053 U	0.07	8.533	6.3	16.100
T29-D	T29-DA	E80317-4	11/8/2000	0-0.5	0.09 U	0.03	8.07	0.09 U	0.06	1.83	0.09 U	0.005	1.29	0.09 U	0.07	28.51	5.8	53.800
	T29-DB	E80317-5	11/8/2000	1-2	0.088 U	0.03	8.445	0.088 U	0.06	1.914	0.088 U	0.005	1.351	0.088 U	0.07	29.839	5.6	56.300
	T29-DC	E80317-6	11/8/2000	2-3	0.072 U	0.03	7.995	0.072 U	0.06	1.812	0.072 U	0.005	1.279	0.072 U	0.07	28.249	6.1	53.300
T29-E	T29-EA	E80317-1	11/8/2000	0-0.5	0.087 U	0.03	7.9	0.087 U	0.06	1.8	0.087 U	0.005	1.3	0.087 U	0.07	27.9	5.9	52.700
	T29-EB	E80317-2	11/8/2000	1-2	0.094 U	0.03	8.715	0.094 U	0.06	1.975	0.094 U	0.005	1.394	0.094 U	0.07	30.793	5.7	58.100
	T29-EC	E80317-3	11/8/2000	2-3	0.082 U	0.03	7.965	0.082 U	0.06	1.905	0.082 U	0.005	1.274	0.082 U	0.07	28.143	5.7	53.100
T30-A	T30-AA	E80720-1	11/13/2000	0-0.5	0.11 U	0.03	15.0	0.11 U	0.06	3.4	0.11 U	0.005	2.4	0.11 U	0.07	53.0	5.7	134.000
	T30-AB	E80720-2	11/13/2000	1-2	0.079 U	0.03	12.585	0.079 U	0.06	2.853	0.079 U	0.005	2.014	0.079 U	0.07	44.467	6.1	83.900
	T30-AC	E80720-3	11/13/2000	2-3	0.074 U	0.03	10.125	0.074 U	0.06	2.295	0.074 U	0.005	1.62	0.074 U	0.07	35.775	6.3	67.500
T30-B	T30-BA	E80720-4	11/13/2000	0-0.5	0.099 U	0.03	15	0.099 U	0.06	3.4	0.099 U	0.005	2.4	0.099 U	0.07	53	6	115.000
	TDUP-18/ T30-BA	E80721-16	11/13/2000	0-0.5	0.100 U	0.03	15	0.100 U	0.06	3.4	0.100 U	0.005	2.4	0.100 U	0.07	53	4.8	123.000
	T30-BB	E80720-5	11/13/2000	1-2	0.086 U	0.03	13.275	0.086 U	0.06	3.009	0.086 U	0.005	2.124	0.086 U	0.07	46.905	6	88.500
T30-C	T30-BC	E80720-6	11/13/2000	2-3	0.068 U	0.03	12.975	0.068 U	0.06	2.941	0.068 U	0.005	2.076	0.068 U	0.07	45.845	5.8	86.500
	T30-CA	E80721-13	11/13/2000	0-0.5	0.059 U	0.03	4.62	0.059 U	0.06	1.047	0.059 U	0.005	0.739	0.059 U	0.07	16.324	6.7	30.800
	T30-CB	E80721-14	11/13/2000	1-2	0.048 U	0.03	2.505	0.048 U	0.06	0.568	0.048 U	0.005	0.401	0.048 U	0.07	8.851	6.6	16.700
T30-D	T30-CC	E80721-15	11/13/2000	2-3	0.065 U	0.03	8.715	0.065 U	0.06	1.975	0.065 U	0.005	1.394	0.065 U	0.07	30.793	5.7	58.100
	T30-DA	E80720-7	11/13/2000	0-0.5	0.113 U	0.03	12.285	0.113 U	0.06	2.785	0.113 U	0.005	1.966	0.113 U	0.07	43.407	6	81.900
	T30-DB	E80720-8	11/13/2000	1-2	0.078 U	0.03	11.52	0.078 U	0.06	2.611	0.078 U	0.005	1.843	0.078 U	0.07	40.704	5.7	76.800
T30-E	T30-DC	E80720-9	11/13/2000	2-3	0.070 U	0.03	12.48	0.070 U	0.06	2.829	0.070 U	0.005	1.997	0.070 U	0.07	44.096	6.2	83.200
	T30-EA	E80720-10	11/13/2000	0-0.5	0.086 U	0.03	12.555	0.086 U	0.06	2.846	0.086 U	0.005	2.009	0.086 U	0.07	44.361	5.7	83.700
	T30-EB	E80721-11	11/13/2000	1-2	0.071 U	0.03	12.06	0.071 U	0.06	2.734	0.071 U	0.005	1.930	0.071 U	0.07	42.612	5.7	80.400
S1	T30-EC	E80721-12	11/13/2000	2-3	0.058 U	0.03	4.575	0.058 U	0.06	1.037	0.058 U	0.005	0.732	0.058 U	0.07	16.165	5.6	30.500
	S1	E80721-1	11/13/2000	0-0.5	0.041 U	0.03	11.28	0.041 U	0.06	2.557	0.041 U	0.005	1.805	0.041 U	0.07	39.856	6.2	75.200
	S2	E80721-20	11/13/2000	0-0.5	0.120 U	0.03	15	0.120 U	0.06	3.4	0.120 U	0.005	2.4	0.120 U	0.07	53	5.6	123.000
S3	S3	E80721-19	11/13/2000	0-0.5	0.100 U	0.03	13.53	0.100 U	0.06	3.067	0.100 U	0.005	2.165	0.100 U	0.07	47.806	5.7	90.200
	S4	E80721-17	11/13/2000	0-0.5	0.099 U	0.03	15	0.099 U	0.06	3.4	0.099 U	0.005	2.4	0.099 U	0.07	53	5.8	101.000
	S5	E80721-18	11/13/2000	0-0.5	0.140 U	0.03	15	0.140 U	0.06	3.4	0.140 U	0.005	2.4	0.140 U	0.07	53	5.8	143.000
S6	S6	E80721-5	11/20/2000	0-0.5	0.061 U	0.03	12.495	0.061 U	0.06	2.832	0.061 U	0.005	1.999	0.061 U	0.07	44.149	5.9	83.300
	S7-A	E81170-19	11/20/2000	0-0.5	0.075 U	0.03	6.09	0.075 U	0.06	1.380	0.075 U	0.005	0.974	0.075 U	0.07	21.518	5.9	40.600
	SDUP-17/ S7-A	E81104-18	11/20/2000	0-0.5	0.039 U	0.03	3.69	0.039 U	0.06	0.836	0.039 U	0.005	0.590	0.039 U	0.07	13.038	5.9	24.600
S7	S7-B	E81170-20	11/20/2000	1-2	0.210 U	0.03	6.780	0.210 U	0.06	1.537	0.210 U	0.005	1.085	0.210 U	0.07	23.956	6.1	45.200
	S7-C	E81104-17	11/20/2000	2-3	0.042 U	0.03	3.555	0.042 U	0.06	0.806	0.042 U	0.005	0.569	0.042 U	0.07	12.561	6.2	23.700
	S8-A	E81170-16	11/20/2000	0-0.5	0.110 U	0.03	8.955	0.110 U	0.06	2.050	0.110 U	0.005	1.433	0.110 U	0.07	31.641	5.6	59.700
S8	S8-B	E81170-17	11/20/2000	1-2	0.75 U	0.03	13.86	0.75 U	0.06	3.142	0.75 U	0.005	2.218	0.75 U	0.07	48.972	5.5	92.400
	S8-C	E81170-18	11/20/2000	2-3	0.060 U	0.03	1.98	0.060 U	0.06	0.449	0.060 U	0.005	0.317	0.060 U	0.07	6.996	5.9	13.200
	S9-A	E81170-13	11/20/2000	0-0.5	0.068 U	0.03	5.775	0.068 U	0.06	1.309	0.068 U	0.005	0.924	0.068 U	0.07	20.405	5.6	38.500
S9	S9-B	E81170-14	11/20/2000	1-2	0.080 U	0.03	7.2	0.080 U	0.06	1.632	0.080 U	0.005	1.152	0.080 U	0.07	25.44	5.6	48.000
	S9-C	E81170-15	11/20/2000	2-3	0.120 U	0.03	7.320	0.120 U	0.06	1.659	0.120 U	0.005	1.171	0.120 U	0.07	25.864	5.9	48.800
	S10-A	E81170-10	11/20/2000	0-0.5	0.061 U	0.03	7.05	0.061 U	0.06	1.598	0.061 U	0.005	1.128	0.061 U	0.07	24.91	5.9	47.000
S10	S10-B	E81170-11	11/20/2000	1-2	0.078 U	0.03	6.81	0.078 U	0.06	1.544	0.078 U	0.005	1.090	0.078 U	0.07	24.062	5.6	45.400
	S10-C	E81170-12	11/20/2000	2-3	0.090 U	0.03	7.74	0.090 U	0.06	1.754	0.090 U	0.005	1.238	0.090 U	0.07	27.348	6.3	51.600
	S11-A	E81170-7	11/20/2000	0-0.5	0.068 U	0.03	6.06	0.068 U	0.06	1.574	0.068 U	0.005	0.970	0.068 U	0.07	21.412	5.8	40.400
S11	S11-B	E81170-8	11/20/2000	1-2	0.130 U	0.03	6.945	0.130 U	0.06	1.574	0.130 U	0.005	1.111	0.130 U	0.07	24.539	6.1	46.300
	S11-C	E81170-9	11/20/2000	2-3	0.075 U	0.03	8.235	0.075 U	0.06	1.867	0.075 U	0.005	1.318	0.075 U	0.07	29.097	6.2	54.900
	S12-A	E81170-4	11/20/2000	0-0.5	0.083 U	0.03	7.53	0.083 U	0.06	1.707	0.083 U	0.005	1.205	0.083 U	0.07	26.606	5.8	50.200
S12	S12-B	E81170-5	11/20/2000	1-2	0.084 U	0.03	6.81	0.084 U	0.06	1.544	0.084 U	0.005	1.090	0.084 U	0.07	24.062	5.9	45.400
	S12-C	E81170-6	11/20/2000	2-3	0.150 U	0.03	7.605	0.150 U	0.06	1.724	0.150 U	0.005	1.217	0.150 U	0.07	26.871	6.2	50.700
	S13-A	E81170-1	11/20/2000	0-0.5	0.047 U	0.03	4.58	0.047 U	0.06	0.993	0.047 U	0.005	0.701	0.047 U	0.07	15.476	5.5	29.200
S13	S13-B	E81170-2	11/20/2000	1-2	0.076 U	0.03	6.51	0.076 U	0.06	1.476	0.076 U	0.005	1.042	0.076 U	0.07	23.002	5.3	43.400
	S13-C	E81170-3	11/20/2000	2-3	0.150 U	0.03	7.305	0.150 U	0.06	1.656	0.150 U	0.005	1.169	0.150 U	0.07	25.811	5.8	48.700
S14	S14	E81503-1	11/28/2000	0-0.5	0.042 U	0.03	3.3	0.042 U	0.06	0.7	0.042 U	0.005	0.5	0.042 U	0.07	11.6	6.1	21.800

Notes:

NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)

Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98).

U = Not detected above the Contract Required Quantitation Limit (CRL).

J = Estimated value.

NA = Not Available

* = Composite Sample

units are mg/kg

TABLE 5-28
Matrix Iron and Metal
Sediment Sample Results: TCL/IAL (Lowest Effects Level)

SAMPLE LOCATION	T1-E	T2-E	T3-E	T3-E	T4-E	T5-E	T6-E	T7-E	T8-E	T9-E	T11-E	T13-E	T13-E	T14-E	T15-E	T15-E	T16-E
SAMPLE ID	T1-EA	T2-EA	T3-EA	TDUP-20/T3-EA	T4-EA	T5-EA	T6-EA	T7-EA	T8-EA	T9-EA	T11-EA	T13-EA	TDUP2/T13-EA	T14-EA	T15-EA	TDUP-17/T15-EA	T16-EA
LAB ID	E81104-14	E79745-1	E80832-7	E80832-10	E79744-1	E79743-2	E79744-4	E79743-11	E79743-14	E80555-14	E79555-1	E79452-11	E79452-14	E78964-9	E78963-11	E78963-14	E79153-9
DATE	11/16/2000	10/31/2000	11/15/2000	11/15/2000	10/30/2000	10/30/2000	10/30/2000	10/31/2000	10/31/2000	11/10/2000	10/27/2000	10/25/2000	10/25/2000	10/18/2000	10/17/2000	10/17/2000	10/26/2000
SAMPLE INTERVAL	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE	NJDEP GSQE LOWEST																
Volatile Organic Compounds	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
Benzene	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
Chloroform	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
cis-1,2-Dichloroethene	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
Ethylbenzene	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
Vinyl chloride	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
Xylene (total)	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U
Semi-Volatile Organic Compounds	NC	0.37 U	1 U	0.62 U	0.5 U	0.86 U	0.47 U	1.7 U	1.1 U	2.2 U	0.71 U	1.1 U	0.68 U	0.64 U	0.73 U	0.72 U	0.75 U
2,4-Dimethylphenol	NC	0.37 U	1 U	0.62 U	0.5 U	0.86 U	0.47 U	1.7 U	1.1 U	2.2 U	0.71 U	1.1 U	0.68 U	0.64 U	0.73 U	0.72 U	0.75 U
Benzo(a)anthracene	0.32	0.087 J	0.099 J	0.049 J	0.027 J	0.057 J	0.47 U	0.11 J	0.07 J	0.13 J	0.096 J	0.056 J	0.045 J	0.64 U	0.13 J	0.26 J	0.18 J
Benzo(a)pyrene	0.37	0.13 J	0.11 J	0.055 J	0.03 J	0.09 J	0.47 U	1.7 U	1.1 U	2.2 U	0.11 J	0.07 J	0.036 J	0.64 U	0.15 J	0.24 J	0.2 J
Benzo(b)fluoranthene	NC	0.16 J	0.14 J	0.052 J	0.041 J	0.087 J	0.47 U	0.14 J	0.11 U	2.2 U	0.084 J	0.07 J	0.03 J	0.64 U	0.14 J	0.26 J	0.24 J
Benzo(k)fluoranthene	0.24	0.12 J	0.091 J	0.05 J	0.029 J	0.066 J	0.47 U	0.095 J	1.1 U	2.2 U	0.11 J	0.062 J	0.042 J	0.64 U	0.13 J	0.25 J	0.2 J
bis(2-Ethylhexyl)phthalate	NC	0.16 J	0.13 J	0.62 U	0.5 U	0.13 J	0.47 U	0.47 J	0.15 J	0.22 U	0.15 J	0.16 J	0.04 J	0.044 J	0.67 J	0.33 J	0.24 J
Dibenz(a,h)anthracene	0.06	0.026 J	1 U	0.62 U	0.5 U	0.86 U	0.47 U	1.7 U	1.1 U	2.2 U	0.71 U	1.1 U	0.68 U	0.64 U	0.73 U	0.72 U	0.75 U
Indeno(1,2,3-cd)pyrene	0.2	0.082 J	1 U	0.032 J	0.02 J	0.86 U	0.47 U	1.7 U	1.1 U	2.2 U	0.067 J	1.1 U	0.68 U	0.64 U	0.074 J	0.094 J	0.098 J
Pesticide & PCB	NC	0.004 U	0.01 U	0.0063 U	0.0072 U	0.0083 U	0.0049 U	0.017 U	0.012 U	0.021 U	0.0079 U	0.058 U	0.0065 U	0.006 U	0.0074 U	0.0069 U	0.0071 U
Dieldrin	0.002	0.004 U	0.01 U	0.0063 U	0.0072 U	0.0083 U	0.0049 U	0.017 U	0.012 U	0.021 U	0.0079 U	0.058 U	0.0065 U	0.006 U	0.0074 U	0.0069 U	0.0071 U
Aroclor 1248	0.03	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.58 U	0.065 U	0.06 U	0.074 U	0.069 U	0.071 U
Aroclor 1254	0.06	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.58 U	0.065 U	0.06 U	0.074 U	0.069 U	0.071 U
Aroclor 1260	0.005	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.58 U	0.065 U	0.06 U	0.074 U	0.069 U	0.071 U
Total Aroclor	0.07	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.58 U	0.065 U	0.06 U	0.074 U	0.069 U	0.071 U
Metals	NC	4,000	10,800	7,710	9,730	10,300	20,300	20,400	12,700	18,100	14,300	12,700	21,500	20,900	19,600	14,600	12,700
Aluminum	NC	1.3 J	2.4 J	1.9 J	2.2 U	3.9 J	5.2 J	5.6 J	6.8 J	11.1 J	37.2	23.4 J	3.1 J	2 J	12.8 J	4.7 J	5.8 J
Antimony	6	6.5 J	11.3 J	8.7 J	10.7 J	11.1 J	10.4 J	16.1 J	17.2 J	20.2 J	20.6 J	14.2 J	18.9 J	13.9 J	18.3 J	16.9 J	17.3 J
Arsenic	NC	40.3 J	113 J	79.2	102	103	23 J	184	125 J	173 J	147	164	156	150	232	139	135
Barium	NC	0.6 J	0.94 J	0.83 J	1 J	0.98 J	1.5	1.8 J	1.6 J	1.9 J	1.4 J	1.1 J	1.5 J	1.3 J	1.9 J	1.5 J	1.4 J
Beryllium	0.6	0.78 J	1.2 J	1.5 J	2.1 J	3.2	0.08 U	3.2 J	3.2 J	4.9 J	1.2 J	1 J	1.2 J	0.29 J	2.7	2.4	2.3
Cadmium	16	18.5 J	46.1 J	34.5 J	40.2 J	40.2 J	7	109 J	72.8 J	102 J	109 J	109 J	109 J	35.3 J	195	181 J	80.6 J
Copper	NC	8,560	25,600	12,800	16,300	17,900	95,100	39,800	24,500	32,300	112,000	27,300	33,900	34,400	40,900	31,000	31,700
Iron	31	26,070	177,300	117,300	117,300	117,300	14.5	22,070	19,400	788 J	15,300 J	2,490	7,788 J	2,225	19,970	494 J	594 J
Lead	NC	24.5	499	253	339	307	50.2	548	360	436	1,390	403	769	346	518	345	249
Manganese	0.2	0.06 J	0.36 J	0.28 J	0.3 J	0.53	0.06 U	0.53	0.27 J	0.28 U	0.26	0.69	0.1 J	0.28	1.1	0.57	0.46
Mercury	16	10.8	24.3 J	20.6 J	25.5 J	28.8 J	7.5 J	45.9	32.4 J	48.5	38	38.7	33.1	26.8 J	45.1	32.9	33.6
Nickel	1	0.22 U	0.63 J	0.71 J	0.85 J	0.85 J	0.18 U	1.7 J	0.73 J	1.7 J	1.5 J	1.4 J	1.4 J	0.75 J	2.6 J	1.4 J	1.7 J
Silver	NC	128 J	203 J	373 J	478 J	169 J	88.5 J	266 J	211 J	555	242 J	272 J	187 J	192 J	190 J	199 J	163 J
Sodium	NC	0.74 U	2.1 U	3 U	3.7 U	1.7 U	1 J	3.3 U	2.3 U	4.3 U	3.6 J	2 U	1.3 U	1.4 U	1.5 U	1.4 U	1.5 U
Thallium	120	103 J	29.1 J	24.1 J	30.6 J	31.1 J	66.2	686 J	1,750	1,210	814 J	591 J	591 J	160	549 J	431 J	431 J
Zinc	Soil Characteristics	NC	6	5.8	5.4	6.7	6.2	5.8	5.8	5.1	5.8	6.1	5.6	8	6.6	5.5	6.1
pH	NC	44,700	43,000	41,200	51,500	74,200	8,930	78,800	93,800	147,000	104,000	65,700	71,900	25,800	50,400	35,200	43,600
Total Organic Carbon	NC	6	5.8	5.4	6.7	6.2	5.8	5.8	5.1	5.8	6.1	5.6	8	6.6	5.5	6.1	5.1

Notes:
NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines Ontario (Persaud et al., 1993)
Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)
U = Not detected above the Contract Required Quantitation Limit (CRQL).
J = Estimated value.
NA = Not Available

TABLE 5-18
Mallico Iron and Metal
Sediment Sample Results: TCL/TAL (Lowest Effects Level)

SAMPLE ID	T17-E	T18-E	T19-E	T19-E	T20-E	T21-A	T22-E	T23-E	T24-E	T25-E	T25-E	T26-E	T27-E	T28-E	T29-E	T30-A	S14
SAMPLE ID	T17-EA	T18-EA	T19-EA	T19-EA	T20-EA	T21-AA	T22-EA	T23-EA	T24-EA	T25-EA	T25-EA	T26-EA	T27-EA	T28-EA	T29-EA	T30-AA	S14
LAB ID	E79931-7	E80721-6	E79933-4	E79933-7	E79932-11	E80047-14	E80556-6	E81103-3	E80556-3	E80554-1	E80047-5	E81103-5	E80157-1	E80317-1	E80720-1	E81503-1	
DATE	11/17/2000	11/14/2000	11/17/2000	11/17/2000	11/2/2000	11/2/2000	11/9/2000	11/17/2000	11/9/2000	11/9/2000	11/9/2000	11/3/2000	11/17/2000	11/6/2000	11/8/2000	11/13/2000	11/28/2000
SAMPLE INTERVAL	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE	NJDEP GSQE LOWEST																
Volatiles Organic Compounds																	
Benzene	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.034 U	0.012 U
Chloroform	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.034 U	0.012 U
cis-1,2-Dichloroethene	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.034 U	0.012 U
Ethylbenzene	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.034 U	0.012 U
Vinyl chloride	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.034 U	0.012 U
Xylene (total)	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.034 U	0.012 U
Semi-Volatile Organic Compounds																	
2,4-Dimethylphenol	NC	0.54 U	0.73 U	0.66 U	0.71 U	0.77 U	0.68 U	0.79 U	0.7 U	0.58 U	0.51 U	0.51 U	0.79 U	0.66 U	2.6 U	0.89 U	1.1 U
Benz(a)anthracene	0.32	0.031 J	0.21 J	0.076 J	0.11 J	0.078 J	0.68 U	0.15 J	0.2 J	0.032 J	0.51 U	0.035 J	0.047 J	0.14 J	0.14 J	0.085 J	0.084 J
Benz(a)pyrene	0.37	0.032 J	0.24 J	0.097 J	0.12 J	0.074 J	0.68 U	0.2 J	0.17 J	0.58 U	0.51 U	0.047 J	0.062 J	0.18 J	0.15 J	0.084 J	0.1 J
Benz(b)fluoranthene	NC	0.036 J	0.17 J	0.075 J	0.11 J	0.077 J	0.68 U	0.19 J	0.16 J	0.58 U	0.51 U	0.003 J	0.054 J	0.21 J	0.15 J	0.093 J	0.099 J
Benz(k)fluoranthene	0.24	0.025 J	0.2 J	0.098 J	0.093 J	0.069 J	0.68 U	0.18 J	0.14 J	0.58 U	0.51 U	0.035 J	0.064 J	0.14 J	0.16 J	0.1 J	0.094 J
bis(2-Ethylhexyl)phthalate	NC	0.54 U	0.22 J	0.75	1.1	0.11 J	0.68 U	0.79	0.7 U	0.58 U	0.51 U	0.51 U	0.082 J	0.37 J	0.39 J	0.41 J	0.14 J
Dibenz(a,h)anthracene	0.06	0.54 U	0.05 J	0.66 U	0.71 U	0.77 U	0.68 U	0.042 J	0.049 J	0.58 U	0.51 U	0.51 U	0.79 U	0.042 J	2.6 U	0.89 U	1.1 U
Indeno(1,2,3-cd)pyrene	0.2	0.54 U	0.12 J	0.66 U	0.71 U	0.77 U	0.68 U	0.12 J	0.094 J	0.58 U	0.51 U	0.51 U	0.79 U	0.11 J	2.6 U	0.89 U	1.1 U
Pesticide & PCB																	
Dieldrin	0.002	0.005 U	0.0074 U	0.0068 U	0.0068 U	0.0083 U	0.0062 U	NA	0.0071 U	0.0064 U	0.0049 U	0.0057 U	0.0089 U	0.0064 U	0.023 U	0.0087 U	0.011 U
Aroclor 1248	0.03	0.05 U	0.074 U	0.068 U	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.089 U	0.064 U	0.23 U	0.087 U	0.11 U
Aroclor 1254	0.06	0.05 U	0.074 U	0.068 U	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.089 U	0.064 U	0.23 U	0.087 U	0.11 U
Aroclor 1260	0.005	0.05 U	0.074 U	0.068 U	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.089 U	0.064 U	0.23 U	0.087 U	0.11 U
Total Aroclor	0.07	0.05 U	0.074 U	0.068 U	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.089 U	0.064 U	0.23 U	0.087 U	0.11 U
Metals																	
Aluminum	NC	10,500	17,400	13,700	15,800	12,300	17,400	17,200	15,800	12,200	13,000	17,500	22,300	11,900	15,300	19,900	15,700
Antimony	NC	0.55 U	1.8 J	1 J	1.1 J	0.87 U	2.3 J	0.81 U	0.63 U	0.55 U	1.4 U	1.6 U	3.3 J	0.63 U	6.9 U	1 U	1.1 U
Arsenic	6	8.3	315	113	273	113	323	103	156	5.7 N	22.7	25.6	18.4	8.6	214.6	17.8	4.6
Barium	NC	84.6	160	170	170	110	196	193	127	101	117	124	208	105	146 J	185	60.3
Beryllium	NC	0.88 J	1.7 J	1.8	2	1.1 J	1.3 J	1.4 J	1 J	0.73 J	0.62 J	2.1	1.9 J	0.95 J	1.5 J	3.1	1.3 J
Cadmium	0.6	1.1	6	4.3	4.4	2.2 J	3	1.7 J	0.84 J	0.1 U	0.25 U	0.29 U	4.1	1.9	21.1	4.3	2.2 J
Copper	16	37.8	2145	103	109	54.3	122	68.6	19.1	10.1	30.2	43.2	97.8	66.4	91.5	67.8	26.4
Iron	NC	18,400	27,900	22,400	27,200	23,000	32,300	32,900	23,100	17,800	43,300	34,500	32,800	19,600	28,000	34,500	10,500
Lead	31	86.8	191	160	185	87.9	323	28.2	28.3	15.3	51	86.6	186	64	102	149	35.7
Manganese	NC	570	316	398	473	358	319	694	483	301	1,080	516	561	335	617	289	198
Mercury	0.2	0.33	1.7	1.1	1.2	0.36	1.9	0.44	0.63	0.51	0.26	0.79	0.82	0.18	0.28 U	0.68	0.15
Nickel	16	18.6	44.3	39.1	41	29.2	42	28.8	25.7	16.9	118.8	49.7	33.9	41.1	28.1	28.1	13
Silver	1	0.99 J	2.6 J	1.1	1.1	0.8	1.6	0.7	0.26 U	0.23 U	0.45 U	0.52 U	0.7 J	0.5 J	2.4 J	1.4 J	0.5 J
Sodium	NC	68.5 J	246 J	138 J	123 J	228 J	314 U	282 J	182 J	218 U	250 U	340 U	157 J	1090 U	467 U	685 J	87.7 J
Thallium	NC	1.2 U	1.5 U	1.3 U	1.4 U	1.8 U	3.4 U	1.8 U	1.3 U	1.2 U	2.3 U	2.7 U	3.6 U	1.3 U	11.7 U	5.1 U	0.75 U
Zinc	120	1,900	3,471	3,375	3,497	3,100	3,449	3,320	2,208	66.9	1,815	1,885	1,532	1,311	407	408	169
Soil Characteristics																	
Ph	NC	6.4	5.9	6.2	6.2	5.5	6.3	5.5	5	5.4	5.3	6.1	5.5	5.8	8.3	5.7	6.1
Total Organic Carbon	NC	54,200	90,200	60,300	10,100	35,000	98,800	57,100	55,600	29,500	11,500	24,100	63,500	59,700	111,000	52,700	21,800

Notes:

NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines Ontario (Persaud et al., 1993)

Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)

U = Not detected above the Contact Required Quantitation Limit (CRQL).

J = Estimated value.

NA = Not Available

TABLE 5-29
Metals Iron and Metal
Sediment Sample Results: TCL/TAL (Severe Effects Level)

SAMPLE LOCATION		T1-E	T2-E	T3-E	T3-E	T4-E	T5-E	T6-E	T7-E	T8-E	T9-E	T11-E	T13-E	T13-E	T14-E	T15-E	T15-E	T16-E
SAMPLE ID		T1-EA	T2-EA	T3-EA	TDUP-10/T3-EA	T4-EA	T5-EA	T6-EA	T7-EA	T8-EA	T9-EA	T11-EA	T13-EA	TDUP2/T13-EA	T14-EA	T15-EA	TDUP-1/T15-EA	T16-EA
LAB ID		E81104-14	E79745-1	E80812-7	E80812-10	E79744-1	E79743-3	E79744-4	E79743-11	E79743-14	E80555-14	E79555-1	E79452-11	E79452-14	E79452-11	E79452-14	E79452-14	E79452-14
DATE		11/16/00	10/31/2000	11/15/2000	11/15/2000	10/30/2000	10/30/2000	10/30/2000	10/31/2000	10/31/2000	11/10/2000	10/27/00	10/25/00	10/25/2000	10/18/00	10/17/00	10/17/2000	10/20/00
SAMPLE INTERVAL		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE	NIDEF GSQE																	
	SEVERE																	
Volatile Organic Compounds																		
Benzene	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U	0.018 U
Chloroform	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U	0.018 U
1,1,2-Trichloroethene	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U	0.018 U
Ethylbenzene	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U	0.018 U
Vinyl chloride	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U	0.018 U
Nitrobenzene (total)	NC	0.011 U	0.03 U	0.02 U	0.022 U	0.028 U	0.016 U	0.049 U	0.036 U	0.067 U	0.022 U	0.03 U	0.02 U	0.017 U	0.022 U	0.019 U	0.021 U	0.018 U
Semi-Volatile Organic Compounds																		
1,4-Dimethylphenol	NC	0.37 U	1 U	0.62 U	0.5 U	0.56 U	0.47 U	1.7 U	1.1 U	2.2 U	0.71 U	1.1 U	0.68 U	0.64 U	0.73 U	0.72 U	0.75 U	0.67 U
Benzofuranthracene	1480	0.087 J	0.099 J	0.049 J	0.027 J	0.057 J	0.47 U	0.11 J	0.07 J	0.13 J	0.096 J	0.056 J	0.045 J	0.64 U	0.13 J	0.26 J	0.18 J	0.67 U
Benzofuranthracene - GSQE	1480	66.2	63.6	61.0	76.2	109.8	132	116.6	138.8	148.0	148.0	97.2	106.4	38.2	74.6	52.1	61.5	84.4
Benzofuranthracene - GSQE	1440	0.13 J	0.11 J	0.055 J	0.03 J	0.09 J	0.47 U	1.7 U	1.1 U	2.2 U	0.71 U	1.1 U	0.68 U	0.64 U	0.73 U	0.72 U	0.75 U	0.67 U
Benzofuranthracene - GSQE	1440	64.4	61.9	59.3	74.2	106.8	129	113.5	135.1	144.0	144.0	94.6	103.5	37.2	72.6	50.7	62.1	82.1
Benzofuranthracene - GSQE	NC	0.16 J	0.14 J	0.052 J	0.041 J	0.087 J	0.47 U	0.14 J	1.1 U	2.2 U	0.084 J	0.07 J	0.03 J	0.64 U	0.13 J	0.26 J	0.18 J	0.67 U
Benzofuranthracene - GSQE	1340	0.12 J	0.091 J	0.05 J	0.029 J	0.066 J	0.47 U	0.095 J	1.1 U	2.2 U	0.11 J	0.062 J	0.042 J	0.64 U	0.13 J	0.26 J	0.18 J	0.67 U
Benzofuranthracene - GSQE	1340	59.9	57.6	55.2	69.0	99.4	120	105.6	125.7	134.0	134.0	88.0	96.3	34.6	67.5	47.2	58.4	76.4
Benzofuranthracene - GSQE	NC	0.16 J	0.13 J	0.062 U	0.5 U	0.13 J	0.47 U	0.47 J	0.15 J	0.22 U	0.15 J	0.16 J	0.04 J	0.64 U	0.13 J	0.26 J	0.18 J	0.67 U
Benzofuranthracene - GSQE	130	0.026 J	1 U	0.62 U	0.5 U	0.86 U	0.47 U	1.7 U	1.1 U	2.2 U	0.71 U	1.1 U	0.68 U	0.64 U	0.73 U	0.72 U	0.75 U	0.67 U
Benzofuranthracene - GSQE	130	5.8	5.6	5.4	6.7	9.6	12	10.2	12.2	13.0	13.0	8.5	9.3	3.4	6.6	4.6	5.7	7.4
Benzofuranthracene - GSQE	320	0.082 J	1 U	0.63 J	0.02 J	0.86 U	0.47 U	1.7 U	1.1 U	2.2 U	0.067 J	1.1 U	0.68 U	0.64 U	0.74 J	0.094 J	0.094 J	0.07 U
Benzofuranthracene - GSQE	320.0	14.3	13.8	13.2	16.5	23.7	29	25.2	30.0	32.0	32.0	21.0	23.0	8.3	16.1	11.3	14.0	18.2
Pesticide & PCB																		
Dieldrin	NC	0.004 U	0.01 U	0.006 U	0.0072 U	0.0083 U	0.0049 U	0.017 U	0.012 U	0.021 U	0.0079 U	0.038 U	0.0065 U	0.005 U	0.0074 U	0.0069 U	0.0074 U	0.006 U
Aroclor 1248	150	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.38 U	0.065 U	0.05 U	0.074 U	0.069 U	0.074 U	0.06 U
Aroclor 1241 - GSQE	150	6.7	6.5	6.2	7.7	11.1	1.3	11.8	14.1	15.0	15.0	9.4	10.8	3.9	7.6	5.3	6.5	8.6
Aroclor 1254	34	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.38 U	0.065 U	0.05 U	0.074 U	0.069 U	0.074 U	0.06 U
Aroclor 1254 - GSQE	34	1.5	1.5	1.4	1.8	2.5	0.3	2.7	3.2	3.4	3.4	2.2	2.4	0.9	1.7	1.2	1.5	1.9
Aroclor 1260	24	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.38 U	0.065 U	0.05 U	0.074 U	0.069 U	0.074 U	0.06 U
Aroclor 1260 - GSQE	24	1.1	1.0	1.0	1.2	1.8	0.2	1.9	2.3	2.4	2.4	1.6	1.7	0.6	1.2	0.8	0.92	1.097
Total Aroclor	530	0.04 U	0.1 U	0.063 U	0.072 U	0.083 U	0.049 U	0.17 U	0.12 U	0.21 U	0.079 U	0.38 U	0.065 U	0.05 U	0.074 U	0.069 U	0.074 U	0.06 U
Total Aroclor - GSQE	530	22.7	22.8	21.8	27.3	39.3	4.7	41.8	49.7	53.0	53.0	34.8	38.1	12.7	26.7	18.7	21.1	30.2
Metals																		
Aluminum	NC	4,900	10,800	7,210	9,730	10,300	10,300	10,400	12,700	18,100	14,300	12,700	22,500	20,900	19,600	14,600	12,700	10,600
Antimony	NC	1.3 J	2.4 J	1.9 J	2.2 U	3.9 J	0.52 J	5.6 J	6.8 J	11.1 J	37.2	23.4 J	3.1 J	2 J	12.8 J	4.7 J	5.8 J	1.5 J
Arsenic	33	6.5	9.9	8.7	10.7	7.1	10.4	16.3	17	20.2	20.6	14.2	18.9	13.9	18.2	16.9	17.2	11.3
Barium	NC	40.3 J	113 J	79.2	102	103	23 J	184	125 J	173 J	147	164	156	150	232	139	135	103
Beryllium	NC	0.6 J	0.94 J	0.83 J	1 J	0.98 J	1.5	1.8 J	1.6 J	1.9 J	1.4 J	1.1 J	1.5 J	1.3 J	1.9 J	1.5 J	1.4 J	1.2 J
Bismuth	10	0.78 J	1.2 J	1.5 J	2.1 J	3.2	0.08 U	3.2 J	3.2 J	4.9 J	1.2 J	3	1.2 J	0.29 J	2.7	2.4	2 J	2.6
Calcium	110	18	46.1	54.5	70.1	80.2	7	109	72.8	102	102	109	109	109	109	109	109	109
Copper	NC	8,560	25,600	12,800	16,300	17,900	95,100	39,800	24,500	32,300	112,000	27,300	33,900	34,300	40,900	31,000	31,700	18,400
Iron	250	76.3	177	161	191	207	14.5	2,070	51,940	106,788	15,300	6,490	7,788	7,788	7,788	7,788	7,788	7,788
Lead	NC	24.5	499	253	339	307	50.2	548	360	436	1,390	403	769	346	518	345	349	354
Manganese	2	0.06 J	0.36	0.28	0.3	0.53	0.06 U	0.53	0.27 J	0.28 U	0.26	0.69	0.1 J	0.28	1.1	0.57	0.46	0.71
Mercury	75	10.8	24.1	20.6	25.5	28.8	7.5 J	45.9	32.4	48.5	38	38.7	33.1	26	45.1	33.9	33.6	27.8
Nickel	NC	0.22 U	0.63 J	0.71 J	0.85 J	1 J	0.18 U	1.7 J	0.73 J	1.7 J	1.5 J	1.4 J	2.3 J	0.75 J	2.6 J	1.3 J	1.1 J	1.7 J
Silver	NC	128 J	203 J	373 J	478 J	169 J	88.5 J	266 J	211 J	555	242 J	272 J	187 J	192 J	190 J	199 J	163 J	126 J
Sodium	NC	0.74 U	2.1 U	3 U	3.7 U	1.7 U	1 J	3.3 U	2.3 U	4.3 U	3.6 J	2 U	1.7 U	1.4 U	1.5 U	1.4 U	1.5 U	1.2 U
Trallium	820	133	291	241	306	511	66.2	696	6,750	21,210	814	591	591	160	549	431	431	334
Soil Characteristics																		
pH	NC	6	5.8	5.4	6.7	6.2	5.8	5.8	5.1	5.8	6.1	5.6	8	6.6	5.5	6.1	5.4	5.1
Total Organic Carbon	NC	44,700	43,000	41,200	51,500	74,200	8,930	78,800	93,800	147,000	104,000	65,700	71,900	25,800	50,400	35,200	43,600	57,000

Notes:
NIDEF GSQE - NIDEF Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)
The SEL criteria for non-polar organics is dependent on the %TOC obtained for each sample. %TOC can range from 1% to 10%. The sample SEL equals the table SEL value multiplied by %TOC.
Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Severe Effects Level (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)
U = Not detected above the Contingency Required Quantitation Limit (CRQL)
J = Estimated value
NA = Not Available

TABLE 5-39
Monte Iron and Metal
Sediment Sample Results: TCL/TAL (Severe Effects Level)

SAMPLE ID	T17-E	T18-E	T19-E	T19-E	T20-E	T21-A	T22-E	T23-E	T24-E	T25-E	T25-E	T26-E	T27-E	T28-E	T29-E	T30-A	S14
SAMPLE ID	T17-EA	T18-EA	T19-EA	T19-EA	T20-EA	T21-AA	T22-EA	T23-EA	T24-EA	T25-EA	T25-EA	T26-EA	T27-EA	T28-EA	T29-EA	T30-AA	S14
LAB ID	E79931-7	E80721-6	E79931-4	E79931-7	E79932-11	E80047-14	E80554-6	E81103-3	E80556-3	E80554-1	E80554-18	E80047-5	E81103-3	E80157-1	E80171-1	E80720-1	E81103-1
DATE	11/01/00	11/14/00	11/01/00	11/12/00	11/02/00	11/03/00	11/09/00	11/12/00	11/09/00	11/09/00	11/09/00	11/12/00	11/12/00	11/12/00	11/12/00	11/12/00	11/12/00
SAMPLE INTERVAL	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTE	ND/EP GSQE	SEVERE															
Volatile Organic Compounds																	
Benzene	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.028 U	0.034 U
Chloroform	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.028 U	0.034 U
1,2-Dichloroethane	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.028 U	0.034 U
Ethylbenzene	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.028 U	0.034 U
Vinyl chloride	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.028 U	0.034 U
Styrene (total)	NC	0.015 U	0.022 U	0.021 U	0.022 U	0.028 U	0.021	0.025 U	0.021 U	0.017 U	0.014 U	0.017 U	0.027 U	0.019 U	0.021 U	0.028 U	0.034 U
Semi-Volatile Organic Compounds																	
2,4-Dimethylphenol	NC	0.54 U	0.73 U	0.66 U	0.71 U	0.77 U	0.68 U	0.79 U	0.7 U	0.55 U	0.51 U	0.51 U	0.79 U	0.66 U	0.76 U	0.99 U	1.1 U
Benz(a)anthracene	1480	0.031 J	0.21 J	0.076 J	0.11 J	0.078 J	0.08 U	0.15 J	0.1 J	0.032 J	0.51 U	0.035 J	0.047 J	0.14 J	0.14 J	0.085 J	0.094 J
Benz(a)anthracene - GSQE	1480	80.2	133.5	89.7	14.9	51.8	146.2	84.5	82.3	43.7	17.0	35.7	94.0	88.4	78.0	148.0	148.0
Benz(a)pyrene	1440	0.032 J	0.24 J	0.097 J	0.12 J	0.074 J	0.08 U	0.1 J	0.17 J	0.58 U	0.51 U	0.047 J	0.062 J	0.18 J	0.15 J	0.084 J	0.1 J
Benz(a)pyrene - GSQE	1440	78.0	129.9	86.5	14.5	50.4	143.3	82.7	80.1	42.5	16.6	34.7	91.4	86.0	75.9	144.0	144.0
Benz(b)fluoranthene	NC	0.036 J	0.17 J	0.075 J	0.11 J	0.077 J	0.08 U	0.19 J	0.16 J	0.58 U	0.51 U	0.003 J	0.054 J	0.21 J	0.15 J	0.093 J	0.099 J
Benz(k)fluoranthene	1340	0.025 J	0.2 J	0.098 J	0.091 J	0.069 J	0.08 U	0.18 J	0.14 J	0.58 U	0.51 U	0.035 J	0.064 J	0.14 J	0.16 J	0.1 J	0.091 J
Benz(k)fluoranthene - GSQE	1340	72.6	120.9	80.8	12.5	46.9	132.4	74.5	71.5	39.5	15.4	32.3	85.1	80.0	70.6	134.0	134.0
Bis(2-Ethylhexyl)phthalate	NC	0.54 U	0.73 U	0.66 U	0.71 U	0.77 U	0.68 U	0.79 U	0.7 U	0.55 U	0.51 U	0.51 U	0.79 U	0.66 U	0.76 U	0.99 U	1.1 U
Dibenz(a,h)anthracene	130	0.54 U	0.05 J	0.75 U	0.71 U	0.77 U	0.68 U	0.041 J	0.049 J	0.58 U	0.51 U	0.51 U	0.79 U	0.66 U	0.76 U	0.99 U	1.1 U
Dibenz(a,h)anthracene - GSQE	130	7.0	11.7	7.8	1.3	4.6	12.3	7.4	7.2	3.8	1.5	3.1	8.3	7.8	13.0	6.9	13.0
Indeno(1,2,3-cd)pyrene	320	0.54 U	0.12 J	0.66 U	0.71 U	0.77 U	0.68 U	0.11 J	0.094 J	0.53 U	0.51 U	0.51 U	0.79 U	0.66 U	0.76 U	0.99 U	1.1 U
Indeno(1,2,3-cd)pyrene - GSQE	320	17.3	28.9	19.3	3.2	11.2	31.6	18.3	17.8	9.4	3.7	7.7	20.3	19.1	32.0	16.9	32.0
Pesticides & PCB																	
Dieldrin	NC	0.005 U	0.0074 U	0.0068 U	0.0068 U	0.0083 U	0.0062 U	NA	0.0071 U	0.0064 U	0.0049 U	0.0057 U	0.0039 U	0.0064 U	0.003 U	0.0037 U	0.011 U
Aroclor 1248	150	0.05 U	0.074 U	0.068 U	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.039 U	0.064 U	0.03 U	0.037 U	0.11 U
Aroclor 1254 - GSQE	150	8.1	13.5	9.0	1.5	5.3	14.8	8.3	8.3	4.4	1.7	3.6	4.5	9.0	15.0	7.9	15.0
Aroclor 1254	34	0.05 U	0.074 U	0.068 U	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.039 U	0.064 U	0.03 U	0.037 U	0.11 U
Aroclor 1254 - GSQE	34	1.1	3.1	2.1	0.3	1.2	3.4	1.9	1.9	1.0	0.4	0.8	2.2	2.0	3.4	1.8	3.4
Aroclor 1260	24	0.05 U	0.074 U	0.069 J	0.068 U	0.083 U	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.039 U	0.064 U	0.03 U	0.037 U	0.11 U
Aroclor 1260 - GSQE	24	1.3	2.2	1.4	0.7	0.4	1.4	1.3	1.3	0.7	0.3	0.6	1.5	1.4	2.4	1.3	2.4
Total Aroclor	530	0.05 U	0.074 U	0.417	0.188	0.15	0.062 U	0.45 U	0.071 U	0.064 U	0.049 U	0.057 U	0.274	0.064 U	0.03 U	0.037 U	0.11 U
Total Aroclor - GSQE	530	28.7	47.8	32.0	5.4	18.6	52.4	30.3	29.5	15.6	6.1	12.8	33.7	31.6	53.0	27.9	53.0
Metals																	
Aluminum	NC	10,500	17,400	13,700	15,800	12,300	17,400	17,200	15,800	12,200	13,000	17,500	22,300	11,900	15,300	19,900	15,300
Antimony	NC	0.55 U	1.8 J	1 J	1.1 J	0.57 U	2.3 J	0.84 U	0.63 U	0.55 U	1.4 U	1.6 U	3.3 J	0.63 U	6.9 U	3 U	1.1 U
Arsenic	33	8.3	31.5	21.2	27.4	11.3	32.2	10.3	15.6	5.7	22.7	25.6	18.4	8.6	14.6	17.8	8.4
Barium	NC	84.6	160	170	170	110	196	193	127	101	117	124	308	105	146 J	185	165
Beryllium	NC	0.88 J	1.7 J	1.8	2	1.1 J	1.3 J	1.4 J	1.7 J	0.73 J	0.61 J	2.1	1.9 J	0.95 J	1.5 J	3.1	1.2 J
Cadmium	10	1 J	6	4.3	4.4	2.2 J	3	1.7 J	0.84 J	0.1 U	0.25 U	0.39 U	4.1	1.9	2.1 J	4.3	2.2 J
Copper	110	37.8	101.5	103	109	54.3	121.2	64.6	49.1	10.1	30.1	43.2	97.8	46.4	66.4	91.5	67.8
Iron	NC	18,400	27,900	22,400	27,200	23,000	32,300	32,400	23,100	17,000	43,300	34,500	33,800	19,600	28,000	34,500	23,400
Lead	230	66.8	191	166	185	87.9	331	95.2	98.3	15.3	51	86.6	186	64	101	149	111
Manganese	NC	570	316	398	473	358	319	494	493	101	1,080	516	561	335	557	617	289
Mercury	2	0.33	1.7	1.1	1.2	0.36	1.9	0.44	0.63	0.51	0.26	0.79	0.82	0.18	0.28 U	0.68	0.45
Nickel	75	18.6	44.3	39.3	41	29.1	42	38.8	25.7	18.9	18.8	20	49.7	22.3	32.9 J	41.1	28.5
Silver	NC	0.99 J	2.6 J	2.1 J	2.3 J	1 J	1.6 J	1.2 J	0.26 U	0.23 U	0.45 U	0.52 U	2.6 J	0.7 J	1.3 J	2.4 J	1.4 J
Sodium	NC	68.5 J	246 J	138 J	123 J	228 J	314 U	282 J	192 J	277 J	218 U	250 U	340 U	157 J	109 J	467 U	685 J
Thallium	NC	1.2 U	1.5 U	1.3 U	1.4 U	1.8 U	3.4 U	1.8 U	1.3 U	1.2 U	2.3 U	2.7 U	3.6 U	1.3 U	1.7 U	5 U	2.3 U
Zinc	820	196	549	524	549	400	549	310	208	66.9	181	188	532	311	407	588	404
Soil Characteristics																	
pH	NC	6.4	5.9	6.2	6.2	5.5	6.3	5.5	5	5.4	5.3	6.1	5.5	5.8	8.3	5.9	5.7
Total Organic Carbon	NC	54,200	90,300	69,300	10,100	15,600	98,100	57,100	55,600	29,500	11,500	24,100	63,500	59,700	111,000	52,700	134,000

Notes:

NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)

The SEL criteria for non-polar organics is dependent on the %TOC obtained for each sample. %TOC can range from 1% to 10%. The sample SEL equals the table SEL value multiplied by %TOC.

Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)

U = Not detected above the Contact Required Quantitation Limit (CRQL)

J = Estimated value

NA = Not Available

TABLE 5-30
Maiteo Iron and Metal
 Sediment Sample Results: PCBs and Metals (Lowest Effects Level)

Sample Location	T4-C	T4-C	T7-C	T9-A	T9-A	T11-D	T11-D	T16-D	T17-D	T17-D	T20-A	T22-A	T22-A	T26-A	T26-A	T28-U	T28-U	T29-D
Sample ID	T4-CA	TDUP5/T4-CA	T7-CA	T9-AA	TDUP-17/T9-AA	T11-DA	TDUP4/T11-DA	T16-DA	T17-DA	TDUP-9/T17-DA	T20-AA	T22-AA	TDUP-16/T22-AA	T26-AA	TDUP-10/T26-AA	T28-1A	TDUP-12/T28-1A	T29-1A
Lab ID	E79744-16	E79744-19	E79745-13	E80555-7	E80555-7	E79555-4	E79555-7	E79453-6	E79932-9	E79932-10	E79931-10	E80556-9	E80556-19	E80047-1	E80017-4	E80157-7	E80157-10	E80157-4
Date	10/30/2000	10/30/2000	10/31/2000	11/10/2000	11/10/2000	10/27/2000	10/27/2000	10/26/2000	11/7/2000	11/2/2000	11/2/2000	11/9/2000	11/9/2000	11/3/2000	11/6/2000	11/6/2000	11/6/2000	11/8/2000
Depth	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Analyte	NJDEP GSQE LOWEST																	
PCB	0.030	0.059 U	0.051 U	0.074 U	0.069 U	0.1 U	0.64 U	0.68 U	0.06	0.094 U	0.034 U	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U
Aroclor 1248	0.030	0.059 U	0.051 U	0.074 U	0.069 U	0.1 U	0.64 U	0.68 U	0.06	0.094 U	0.034 U	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U
Aroclor 1254	0.060	0.059 U	0.051 U	0.074 U	0.069 U	0.1 U	0.64 U	0.68 U	0.06	0.094 U	0.034 U	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U
Aroclor 1260	0.005	0.059 U	0.051 U	0.074 U	0.069 U	0.1 U	0.64 U	0.68 U	0.06	0.094 U	0.034 U	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U
Total Aroclor	0.070	0.059 U	0.051 U	0.074 U	0.069 U	0.1 U	0.64 U	0.68 U	0.06	0.094 U	0.034 U	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U
Metals																		
Aluminum	NC	3,530	N/A	20,300	17,900	N/A	18,000	N/A	11,300	16,500	N/A	15,900	5,580	N/A	21,300	N/A	17,400	N/A
Antimony	NC	0.71 J	N/A	0.65 U	0.72 U	N/A	3.1 J	N/A	2.6 J	1.7 J	N/A	1.3 J	0.67 J	N/A	2.6 U	N/A	3 U	N/A
Arsenic	6	4.1	N/A	3.7 J	3.9 J	N/A	15.1 J	N/A	12.5 J	14.2 J	N/A	10.9 J	4.1	N/A	15.8	N/A	13.2	N/A
Barium	NC	46.6 J	N/A	131	177	N/A	175	N/A	111	157	N/A	163	61.9	N/A	184	N/A	145	N/A
Beryllium	NC	0.4 J	N/A	1.1 J	1.7 J	N/A	1.7 J	N/A	1.3	1.5 J	N/A	1.4 J	0.5 J	N/A	1.5 J	N/A	1.5 J	N/A
Cadmium	0.6	0.82 J	N/A	0.11 U	4.6	N/A	4	N/A	3.2	3	N/A	2.9	0.95 J	N/A	2.9	N/A	2.2 J	N/A
Copper	16	7.25 J	N/A	14	104 J	N/A	88.0	N/A	69.3 J	76.2 J	N/A	71.7	27.2	N/A	78	N/A	63.6	N/A
Iron	NC	9,080	N/A	24,500	28,700	N/A	30,700	N/A	17,500	32,000	N/A	26,000	10,300	N/A	39,000	N/A	30,200	N/A
Lead	31	15.7 J	N/A	25.5	13.7 J	N/A	232 J	N/A	152 J	141 J	N/A	104	37.6	N/A	117	N/A	85.5	N/A
Manganese	NC	152	N/A	255	394	N/A	456	N/A	225	758	N/A	561	184	N/A	1120	N/A	736	N/A
Mercury	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel	16	10 J	N/A	40.7 J	40.7 J	N/A	40.4 J	N/A	27.9 J	33.2 J	N/A	30.6	12.1	N/A	39.2	N/A	32.1	N/A
Silver	1	0.41 J	N/A	0.27 U	0.33 J	N/A	2.1 J	N/A	1.8 J	1.8 J	N/A	1.3 J	0.59 J	N/A	1.4 J	N/A	1.4 J	N/A
Sodium	NC	92.8 J	N/A	132 J	229 J	N/A	258 J	N/A	92.1 J	135 J	N/A	86.9 J	108 J	N/A	415 U	N/A	470 U	N/A
Thallium	NC	1.1 U	N/A	1.4 U	1.7 J	N/A	2 U	N/A	0.79 U	1.9 U	N/A	1.8 U	0.74 U	N/A	4.4 U	N/A	5 U	N/A
Zinc	120	115 J	N/A	101	581 J	N/A	5430 J	N/A	392 J	489 J	N/A	375 J	168 J	N/A	484 J	N/A	397 J	N/A
Soil Characteristics																		
Total Organic Carbon	NC	23,900	3,720	16,000	52,400	63,400	58,800	68,400	29,200	27,000	30,000	44,400	18,600	70,000	54,300	48,500	52,100	56,700
pH	NC	6.5	6.7	6.1	5.6	5.6	5.8	5.8	5.6	6.1	6.1	5.8	6	5.5	6.7	6.1	5.9	5.9

Notes:

NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines Ontario (Persaud et al., 1993)

Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)

U = Not detected above the Contract Required Quantitation Limit (CRQL).

J = Estimated value

N/A = Not Available

TABLE 5-31
Matteo Iron and Metal
Sediment Sample Results: PCBs and Metals (Severe Effects Levels)

Sample Location Sample ID Lab ID Date Depth		T4-C	T4-C	T7-C	T9-A	T9-A	T11-D	T11-D	T16-D	T17-D	T17-D	T20-A	T22-A	T22-A	T26-A	T26-A	T28-B	T28-B	T29-D
		T4-CA	TDUP5/T4-CA	T7-CA	T9-AA	TDUP-17/T9-AA	T11-DA	TDUP4/T11-DA	T16-DA	T17-DA	TDUP-9/T17-DA	T20-AA	T22-AA	TDUP-16/T22-AA	T26-AA	TDUP-10/T26-AA	T28-BA	TDUP-12/T28-BA	T29-DA
		E79744-16	E79744-19	E79745-13	E80555-7	E80555-10	E79555-4	E79555-7	E79453-6	E79932-9	E79932-10	E79931-10	E80556-9	E80556-19	E80047-1	E80047-4	E80157-7	E80157-10	E80317-4
		10/30/2000	10/30/2000	10/31/2000	11/10/2000	11/10/2000	10/27/2000	10/27/2000	10/26/2000	11/2/2000	11/2/2000	11/2/2000	11/9/2000	11/9/2000	11/3/2000	11/3/2000	11/6/2000	11/6/2000	11/8/2000
Analyte	NJDEP GSQE SEVERE	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
		PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB	PCB
		Aroclor 1248	Aroclor 1248 - GSQE	Aroclor 1254	Aroclor 1254 - GSQE	Aroclor 1260	Aroclor 1260 - GSQE	Total Aroclor	PCB Total - GSQE	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Copper	Iron	Lead	Mercury
		150	150	34	34	24	24	530	530	NC	NC	33	NC	NC	10	110	NC	250	0.2
		0.059 U	0.051 U	0.074 U	0.069 U	0.100 U	0.064 U	0.06 U	0.094 U	0.084 U	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U	0.09 U	
		3.59	1.50	2.40	7.86	9.51	8.82	10.26	4.38	4.50	6.66	2.79	10.30	8.15	7.28	7.82	8.51	8.07	
		0.059 U	0.051 U	0.074 U	0.069 U	0.100 U	0.064 U	0.06 U	0.094 U	0.11	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U	0.09 U	
		0.81	0.34	0.54	1.78	2.16	2.00	2.33	0.99	0.92	1.02	1.51	0.63	2.38	1.85	1.65	1.77	1.93	1.83
		0.059 U	0.051 U	0.074 U	0.069 U	0.100 U	0.064 U	0.06 U	0.094 U	0.1 J	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U	0.09 U	
		0.57	0.24	0.38	1.26	1.52	1.41	1.64	0.70	0.65	0.72	1.07	0.45	1.68	1.30	1.16	1.25	1.36	1.29
		0.059 U	0.051 U	0.074 U	0.069 U	0.100 U	0.064 U	0.06 U	0.094 U	0.21	0.08 U	0.23 U	0.096 U	0.098 U	0.092 U	0.099 U	0.087 U	0.09 U	
		12.67	5.30	8.48	27.77	33.60	31.16	36.25	15.48	14.31	15.90	23.53	9.86	37.10	28.78	25.71	27.61	30.05	28.51
		Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals	Metals
		Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
		NC	3,530	NT	20,300	17,900	NT	18,000	NT	11,300	16,500	NT	15,900	5,580	NT	21,300	NT	17,400	NT
		Antimony	NC	0.71 J	NT	0.63 U	0.72 U	NT	3.1 J	NT	2.6 J	1.7 J	NT	1.3 J	0.67 J	NT	2.6 U	NT	2.6 U
		Arsenic	33	4.1	NT	3.7 J	18.9	NT	15.1	NT	12.5	14.2	NT	10.9	4.1	NT	15.8	NT	15.9
		Barium	NC	46.6 J	NT	131	177	NT	175	NT	111	157	NT	163	61.9	NT	184	NT	173
		Beryllium	NC	0.4 J	NT	1.1 J	1.7 J	NT	1.7 J	NT	1.3	1.5 J	NT	1.4 J	0.5 J	NT	1.5 J	NT	2.7
		Cadmium	10	0.82 J	NT	0.11 U	4.6	NT	4	NT	3.2	3	NT	2.9	0.95 J	NT	2.9	NT	2.8
		Copper	110	25.1	NT	14	104	NT	88.9	NT	69.3	76.2	NT	71.7	27.2	NT	78	NT	71.3
		Iron	NC	9,080	NT	24,500	28,700	NT	30,700	NT	17,500	32,000	NT	26,000	10,300	NT	39,000	NT	40,900
		Lead	250	69.4	57.2	25.5 N	172	137	232	152	141	146	104	37.6	96.3	117	92	85.5	98.3
		Mercury	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Manganese	NC	152	NT	255	394	NT	456	NT	225	758	NT	561	184	NT	1120	NT	1120
		Nickel	75	10 J	NT	25.8	40.7	NT	40.4	NT	27.9	33.2	NT	30.6	12.1	NT	39.2	NT	35.3
		Silver	NC	0.41 J	NT	0.27 U	2.3 J	NT	2.1 J	NT	1.8 J	1.6 J	NT	1.7 J	0.59 J	NT	1.4 J	NT	1.9 J
		Thallium	NC	1.1 U	NT	1.4 U	1.7 J	NT	2 U	NT	0.79 U	1.9 U	NT	1.8 U	0.74 U	NT	4.4 U	NT	4.4 U
		Zinc	820	161	NT	101	581	NT	530	NT	392	489	NT	375	168	NT	484	NT	455
		Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics	Soil Characteristics
		Total Organic Carbon	NC	23,900	3,720	16,000	52,400	63,400	58,800	68,400	29,200	27,000	30,000	44,400	18,600	70,000	54,300	48,500	52,100
		pH	NC	6.5	6.7	6.1	5.6	5.6	5.8	5.8	5.6	6.1	5.8	6	5.5	6.7	6.1	5.9	5.9

Notes:
 NJDEP GSQE - NJDEP Guidance For Sediment Quality Evaluations (11/98), Freshwater Sediment Screening Guidelines Ontario (Persaud et al., 1993)
 Shaded values meet or exceed New Jersey Guidance For Sediment Quality Evaluations - Lowest Effects Level (11/98), Freshwater Sediment Screening Guidelines - Ontario (Persaud et al., 1993)
 U = Not detected above the Contract Required Quantitation Limit (CRQL).
 J = Estimated value.
 N/A = Not Available

TABLE 5-32
Manganese Iron and Metal
 Surface Water Sample Results

Sample Location	Sample ID	Lab ID	Date	Lead (ug/l) Corrected	Lead (ug/l) Filtered	Lead (ug/l) Unfiltered	Hardness (mg/l)	Salinity	pH	Dissolved Oxygen (mg/l)
T1-C	T1-CHF	E81101-7	11/17/2000	2.46			N/T	0.00	7.16	3.00
	T1-CHU	E81101-6	11/17/2000			26 H	98	0.00	7.16	3.00
T1-C	T1-CLF	E81101-9	11/17/2000	2.46	2.3 U		N/T	0.00	6.47	3.86
	T1-CLU	E81101-8	11/17/2000				98	0.00	6.47	3.86
T1-D	T1-DHF	E81101-5	11/17/2000	3.01	2.4 J		N/T	0.00	7.09	1.95
	T1-DHU	E81101-4	11/17/2000			49.5 H	118	0.00	7.09	1.95
T1-D	T1-DLF	E81101-3	11/17/2000	6.86	2.3 U		N/T	0.00	5.41	4.04
	T1-DLU	E81101-2	11/17/2000			71.4 H	255	0.00	5.41	4.04
T3-C	T3-CHF	E80831-1	11/15/2000	2.36	1.3 U		N/T	0.00	7.09	7.52
	T3-CHU	E80830-10	11/15/2000			6.2 H	94.1	0.00	7.09	7.52
T3-C	T3-CLF	E80830-7	11/15/2000	2.60	2.3 U		N/T	0.00	6.93	7.32
	T3-CLU	E80830-6	11/15/2000			34.4 H	103	0.00	6.93	7.32
T3-D	T3-DHF	E80831-3	11/15/2000	2.68	1.3 U		N/T	0.00	7.06	7.66
	T3-DHU	E80831-2	11/15/2000			72.7 H	106	0.00	7.06	7.66
T3-D	T3-DLU	E80831-4	11/15/2000			74.7 H	N/T	0.00	7.06	7.66
	T3-DLF	E80830-9	11/15/2000	2.63	2.3 U		N/T	0.00	7.20	7.24
T9-C	T9-CHF	E80830-18	11/10/2000	2.46	1.3 U		N/T	N/A	N/A	N/A
	T9-CHU	E80583-19	11/10/2000			1.4 J	98	N/A	N/A	N/A
T9-C	T9-CLF	E80722-3	11/13/2000	3.01	1.3 U		N/T	0.00	5.85	4.54
	T9-CLU	E80722-4	11/13/2000			69 H	118	0.00	5.85	4.54
T9-D	T9-DHF	E80583-16	11/10/2000	2.25	1.8 J		N/T	N/A	N/A	N/A
	T9-DHU	E80583-17	11/10/2000			5 H	90.2	N/A	N/A	N/A
T9-D*	T9-DLF	E80722-1	11/13/2000	2.90	1.3 U		N/T	0.00	6.65	7.21
	T9-DLU	E80722-2	11/13/2000			28.5 H	114	0.00	6.65	7.21
T18-C	T18-CHF	E80722-16	11/14/2000	2.52	1.3 U		N/T	N/A	N/A	N/A
	T18-CHU	E80722-15	11/14/2000			5 H	100	N/A	N/A	N/A
T18-C	T18-CLF	E80830-2	11/15/2000	2.46	2.6 J		N/T	0.00	5.93	6.40
	T18-CLU	E80830-1	11/15/2000			14.5 H	98	0.00	5.93	6.40
T18-D	T18-DHF	E80722-14	11/14/2000	2.57	1.3 U		N/T	N/A	N/A	N/A
	T18-DHU	E80722-13	11/14/2000			1.9 J	102	N/A	N/A	N/A
T18-D	T18-DLF	E80830-5	11/15/2000	2.46	2.3 U		N/T	0.00	6.48	7.73
	T18-DLU	E80830-4	11/15/2000			87.4 H	98	0.00	6.48	7.73
T25-C	T25-CHF	E80583-4	11/9/2000	2.36	1.8 J		N/T	0.00	6.85	7.55
	T25-CHU	E80583-5	11/9/2000			3.7	N/T	0.00	6.85	7.55
T25-C	T25-CLF	E80583-6	11/9/2000				94.1	0.00	6.85	7.55
	T25-CLU	E80583-13	11/9/2000	2.46	1.3 U		N/T	0.00	6.85	7.55
T25-C	T25-CHU	E80583-14	11/9/2000			4.3	N/T	0.00	6.85	7.55
	T25-CHH	E80583-15	11/9/2000				98	0.00	6.85	7.55
T25-C	T25-CLF	E80583-10	11/9/2000	2.46	1.3 U		N/T	0.00	7.11	8.07
	T25-CLU	E80583-11	11/9/2000			2.3 J	N/T	0.00	7.11	8.07
T25-D	T25-DHF	E80583-12	11/9/2000				98	0.00	7.11	8.07
	T25-DHU	E80583-1	11/9/2000	2.36	1.8 J		N/T	0.00	6.55	7.24
T25-D	T25-DHF	E80583-2	11/9/2000			2.6 J	N/T	0.00	6.55	7.24
	T25-DHU	E80583-3	11/9/2000				94.1	0.00	6.55	7.24
T25-D	T25-DLF	E80583-7	11/9/2000	2.25	1.3 U		N/T	0.00	6.97	8.12
	T25-DLU	E80583-8	11/9/2000			4.6	N/T	0.00	6.97	8.12
T30-B	T30-BHF	E80722-12	11/13/2000	2.36	1.3 U		N/T	0.00	7.52	6.23
	T30-BHU	E80722-11	11/13/2000			3.3	94.1	0.00	7.52	6.23
T30-B	T30-BLF	E80722-8	11/13/2000	2.74	1.3 U		N/T	N/A	N/A	N/A
	T30-BLU	E80722-7	11/13/2000			41.6 H	108	N/A	N/A	N/A
T30-C	T30-CHF	E80722-9	11/13/2000	2.46	1.3 U		N/T	0.01	7.46	8.10
	T30-CHU	E80722-10	11/13/2000			1.8 J	98	0.01	7.46	8.10
T30-C	T30-CLF	E80722-6	11/13/2000	2.68	1.3 U		N/T	0.00	7.15	7.53
	T30-CLU	E80722-5	11/13/2000			24.3 H	106	0.00	7.15	7.53

Notes:

NJDEP Surface Water Quality Standards (N.J.A.C. 5/00)

Aquatic SWQS for Lead is 2.5 ug/l (total)

Aquatic SWQS for Lead (dissolved) is dependent on hardness. The following equations will provide the new criteria.

$$\text{Chronic criterion (dissolved)} = \text{WER} \times e^{(1.09(\ln(\text{hardness}) - 1.0))} \times \text{chronic CF}$$

$$\text{chronic CF} = 1.46203 - ((\ln(\text{hardness}) \times 0.145712))$$

Human health SWQS for Lead is 5 ug/l

SWQS for pH ranges from 6.5 to 8.5.

SWQS for Dissolved Oxygen (mg/L) not less than 4.0 at any time.

Shaded values meet or exceed New Jersey Surface Water Quality Standards - Aquatic (N.J.A.C. 5/00).

Shaded and an H meet or exceed human health (N.J.A.C. 5/00)

Delaware River Basin Commission - Administrative Manual - Part III (October 23, 1995) TABLE 5: Stream Quality Objectives for Toxic Pollutants for the Protection of Aquatic Life in the Delaware River Estuary - Lead is 16 ug/l.

Due to the low tide no water was available on the mud flat, T9-DL was collected from a small seep draining into the Hessian Run.

U = Not detected above the Contract Required Quantitation Limit (CRQL).

J = Estimated value.

N/T = Not Tested

N/A = Not Available

TABLE 5-33
Matteo Iron and Metal
OBSERVED VEGETATION

Scientific Name	Common Name	Regional Indicator Status
<i>Acer negundo</i>	boxelder	FAC+
<i>Acer rubrum</i>	red maple	FAC
<i>Acer saccharinum</i>	silver maple	FACW
<i>Achillea millefolium</i>	yarrow	FACU
<i>Agrostis hyemalis</i>	tickle grass	FAC
<i>Ailanthus altissima</i>	tree of heaven	NI
<i>Allium stellatum</i>	wild onion	UPL
<i>Andropogon virginicus</i>	broom sedge	FACU
<i>Artemisia sp.</i>	mugwort	--
<i>Aster vimineus</i>	small white aster	FAC
<i>Betula alba</i>	white birch	FAC+
<i>Betula alleghaniensis</i>	yellow birch	FAC
<i>Betula nigra</i>	black birch	FACW
<i>Brassica rapa</i>	mustard	UPL
<i>Carex stricta</i>	tussock sedge	OBL
<i>Carya ovata</i>	shagbark hickory	FACU-
<i>Catalpa bignonioides</i>	catalpa	UPL
<i>Cornus stolonifera</i>	red-osier dogwood	FACW+
<i>Daucus carota</i>	Queen Ann's lace	UPL
<i>Fraxinus pennsylvanica</i>	green ash	FACW
<i>Geditsia triancanthos</i>	honey locust	UPL
<i>Geranium sp.</i>	geranium	--
<i>Gymnocladus dioica</i>	coffee tree	UPL
<i>Ilex opaca</i>	American holly	FACU+
<i>Impatiens capensis</i>	jewelweed	FACW
<i>Juniperus virginiana</i>	red cedar	FACU
<i>Lactuca canadensis</i>	wild lettuce	FACU-
<i>Lespedeza virginica</i>	slender bush clover	--
<i>Liquidambar styraciflua</i>	sweet gum	FAC
<i>Liriodendron tulipifera</i>	tulip popular	FACU
<i>Lonicera japonica</i>	Japanese honeysuckle	FAC-
<i>Morus rubra</i>	mulberry	FACI
<i>Panicum clandestinum</i>	deer tongue	NI
<i>Panicum dichotomiflorum</i>	fall panicum	FACW-
<i>Paulownia tomentosa</i>	princess tree	UPL
<i>Phragmites australis</i>	common reed	FACW
<i>Phytolacca americana</i>	pokeweed	FACU+
<i>Pinus strobus</i>	white pine	FACU
<i>Pinus virginiana</i>	scrub pine	UPL
<i>Peltandra virginica</i>	arrow arum	OBL
<i>Plantanus occidentalis</i>	sycamore	FACW-

Table 5-33 (Continued)

Scientific Name	Common Name	Regional Indicator Status
<i>Pontederia</i> sp.	pickerel weed	OBL
<i>Populus deltoides</i>	cottonwood	FAC
<i>Populus tremula</i>	quaking aspen	FACU
<i>Potentilla</i> sp.	cinquefoil	—
<i>Prunus serotina</i>	black cherry	FACU
<i>Pycnanthemum</i> sp.	mountain mint	—
<i>Pyrus malus</i>	apple	UPL
<i>Quercus alba</i>	white oak	FACU-
<i>Quercus palustris</i>	pin oak	FACW
<i>Quercus phellos</i>	willow oak	FAC+
<i>Quercus rubra</i>	red oak	—
<i>Quercus stellata</i>	post oak	UPL
<i>Rhus copallinum</i>	winged sumac	NI
<i>Rhus typhina</i>	staghorn sumac	UPL
<i>Rosa multiflora</i>	multi-flora rose	FACU
<i>Rubus allegheniensis</i>	blackberry	FACU-
<i>Rubus hispidus</i>	dewberry	FACW
<i>Rubus idaeus</i>	raspberry	FAC-
<i>Sagittaria</i> sp.	arrow-head	OBL
<i>Salix bebbiana</i>	Bebb willow	FACW
<i>Sambucus canadensis</i>	elderberry	FACW-
<i>Saponaria officinalis</i>	bouncing bet	FACU-
<i>Sassafras albidum</i>	sassafras	FACU-
<i>Smilax rotundifolia</i>	green briar	FAC
<i>Solidago</i> spp.	goldenrod	—
<i>Sphagnum</i> sp.	sphagnum	OBL
<i>Spirea</i> sp.	spirea	—
<i>Tilia americana</i>	basswood	FACU
<i>Toxicodendron radicans</i>	poison ivy	FAC
<i>Trifolium</i> sp.	clover	—
<i>Typha latifolia</i>	cattails	OBL
<i>Ulmus americana</i>	American elm	FACW-
<i>Verbascum thapsus</i>	mullen	UPL
<i>Vernonia noveboracensis</i>	New York ironweed	FACW+
<i>Viburnum lentago</i>	nannyberry	FAC
<i>Viburnum recognitum</i>	northern arrowwood	FACW-
<i>Vitis labrusca</i>	fox grape	FACU

Key to indicator categories:

OBL: Obligate Wetland, occur almost always (estimated probability >99%) under natural conditions in wetlands

FACW: Facultative Wetland, usually occur in wetlands (estimated probability 67%-99%); occasionally found in non-wetlands

FAC: Facultative, equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%)

FACU: Facultative Upland, usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%)

(+) Following an indicator indicates a frequency toward the higher end of a category

(-) Following an indicator indicates a frequency toward the lower end of a category

Source: National List of Plant Species that Occur in Wetlands: Northeast (Region 1), US Fish and Wildlife Service, May 1988.

TABLE 5-34
Matteo Iron and Metal
OBSERVED BIRDS

Common Name	Scientific name
American crow	<i>Corvus brachyrhynchos</i>
belted kingfisher	<i>Ceryle alcyon</i>
blue jay	<i>Cyanocitta cristata</i>
Canada Goose	<i>Branta canadensis</i>
Carolina chickadee	<i>Poecile carolinensis</i>
downy woodpecker	<i>Dicoides pubescens</i>
great horned owl	<i>Bubo virginianus</i>
herring gull	<i>Larus argentatus</i>
house sparrow	<i>Passer domesticus</i>
killdeer	<i>Charadrius vociferus</i>
mallard	<i>Anas platyrhynchos</i>
mockingbird	<i>Mimus polyglottos</i>
mourning dove	<i>Zenaida macroura</i>
northern cardinal	<i>Cardinalis cardinalis</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
red-winged blackbird	<i>Agelaius phoeniceus</i>
song sparrow	<i>Melospiza melodia</i>
white-breasted nuthatch	<i>Sitta carolinensis</i>

Source: The Louis Berger Group, December 2000.

TABLE 5-35
Matteo Iron and Metal
POTENTIAL BREEDING BIRDS

Common Name	Scientific Name
American crow	<i>Corvus brachyrhynchos</i>
American goldfinch	<i>Carduelis tristis</i>
American robin	<i>Turdus migratorius</i>
Baltimore oriole	<i>Icterus galbula</i>
barn swallow	<i>Hirundo rustica</i>
blue jay	<i>Cyanocitta cristata</i>
brown thrasher	<i>Toxostoma rufum</i>
brown-headed cowbird	<i>Molothrus aler</i>
Canada goose	<i>Branta canadensis</i>
Carolina chickadee	<i>Poecile caolinensis</i>
cedar waxwing	<i>Bombycilla cedrorum</i>
chimney swift	<i>Chaetura pelagica</i>
common grackle	<i>Quiscalus quiscula</i>
common yellowthroat	<i>Geothypis</i>
downy woodpecker	<i>Dicoides pubescens</i>
eastern kingbird	<i>Tyrannus tyrannus</i>
European starling	<i>Sturnus vulgaris</i>
gray catbird	<i>Dumetella carolinensis</i>
great crested flycatcher	<i>Myiarchus crinitus</i>
great horned owl	<i>Bubo virginianus</i>
house finch	<i>Carpodacus mexicanus</i>
house sparrow	<i>Passer domesticus</i>
house wren	<i>Troglodytes aedon</i>
killdeer	<i>Charadrius vociferus</i>
mallard	<i>anas platyrhynchos</i>
marsh wren	<i>Cistothorus palustris</i>
mourning dove	<i>Zehaida macroura</i>
northern cardinal	<i>cardinalis cardinalis</i>
northern flicker	<i>Colaptes auratus</i>
northern mockingbird	<i>Minus polyglottos</i>
orchard oriole	<i>Icterus spurius</i>
purple martin	<i>Progne subis</i>
red-eyed vireo	<i>Vireo olivaceus</i>
red-tail hawk	<i>Buteo jamaicensis</i>
red-winged blackbird	<i>Agelaius phoeniceus</i>
rock dove	<i>Columba livia</i>
song sparrow	<i>Melospiza melodia</i>
tree swallow	<i>Tachycynets bicolor</i>
tufted titmouse	<i>Baeolophus bicolor</i>
yellow warbler	<i>Dendroica petechia</i>

Source: Birds of New Jersey, New Jersey Audubon Society, 1999.

TABLE 5-36
Matteo Iron and Metal
POTENTIAL WETLAND DEPENDENT BIRD SPECIES

Common Name	Scientific Name
American bittern	<i>Botaurus lentiginosus</i>
Belted Kingfisher	<i>Ceryle alcyon</i>
Black crowned night heron	<i>Nycticorax nycticorax</i>
Black duck	<i>Anas rubripes</i>
Canada goose	<i>Branta canadensis</i>
Great blue heron	<i>Ardea herodias</i>
Greater yellow legs	<i>Tringa melanoleuca</i>
Green heron	<i>Butorides virescens</i>
Least bittern	<i>Ixobrychus exilis</i>
Lesser yellow legs	<i>Tringa flavipes</i>
Mallard	<i>Anas platyrhynchos</i>
Marsh wren	<i>Cistothorus palustris</i>
Osprey	<i>Pandion haliaetus</i>
Red winged blackbird	<i>Agelaius phoeniceus</i>
Snowy egret	<i>Egretta thula</i>
Spotted sandpiper	<i>Actitis macularia</i>
Swamp sparrow	<i>Melospiza georgiana</i>
Tundra swan	<i>Cygnus columbianus</i>
Virginia rail	<i>Rallus limicola</i>
Great egret	<i>Ardea alba</i>
Wood duck	<i>Aix sponsa</i>

Source: Birds of New Jersey, New Jersey Audubon Society, 1999.

TABLE 5-37
Matteo Iron and Metal
FISH SPECIES OF WOODBURY CREEK AND HESSIAN RUN

Common Name	Scientific Name
Mummichog	<i>Fundulus heteroclitus</i>
Banded killifish	<i>Fundulus diaphanus</i>
Silvery minnow	<i>Hybognathus nuchalis</i>
Alewife	<i>Alsoa pseudoharengus</i>
Blueback herring	<i>Alsoa aestivalis</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Brown bullhead	<i>Ictalurus nebulosus</i>
White perch	<i>Morone americana</i>
American eel	<i>Anguilla rostrata</i>
Goldfish	<i>Carrasius auratus</i>
Spottail shiner	<i>Notropis hudsonius</i>
Carp	<i>Cyprinus carpio</i>
Bluntnose minnow	<i>Pimephales notatus</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Eastern mudminnow	<i>Umbra pygmaea</i>
Golden shiner	<i>Notemigonus crysoleucas</i>

Table 5-38
Matteo Iron and Metal
Well Search Results

MAP NO.	RI SAMPLE ID	OWNER'S NAME	ADDRESS	BLOCK / LOT	PERMIT NO.	WELL USE	TOTAL DEPTH	SCREEN ZONE
1	PW-3	Grover Riehl	Crown Point Rd., West Deptford	325 / 8	31-52940	Dom.	103	93-103
2 *	PW-1	Linda Sabatini	West Deptford	128 / 2.01	N/A	Dom.	N/A	N/A
3 *	PW-2	Matteo Iron and Metal	West Deptford	128 / 2	N/A	Dom.	N/A	N/A
4	-	Coastal Eagle Point Oil Co.	West Deptford	N/A	31-17788	Prod.	335	N/A
5	-	Coastal Eagle Point Oil Co.	West Deptford	N/A	31-06834	Prod.	306	N/A
6	-	West Deptford Water Dept.	West Deptford	N/A	51-00063	Prod.	366	N/A
7	-	National Park Borough	National Park	N/A	31-02555	Prod.	282	N/A
8	-	National Park Borough	National Park	N/A	31-17938	Prod.	275	N/A

Notes:

Depth and screen zone reported in feet

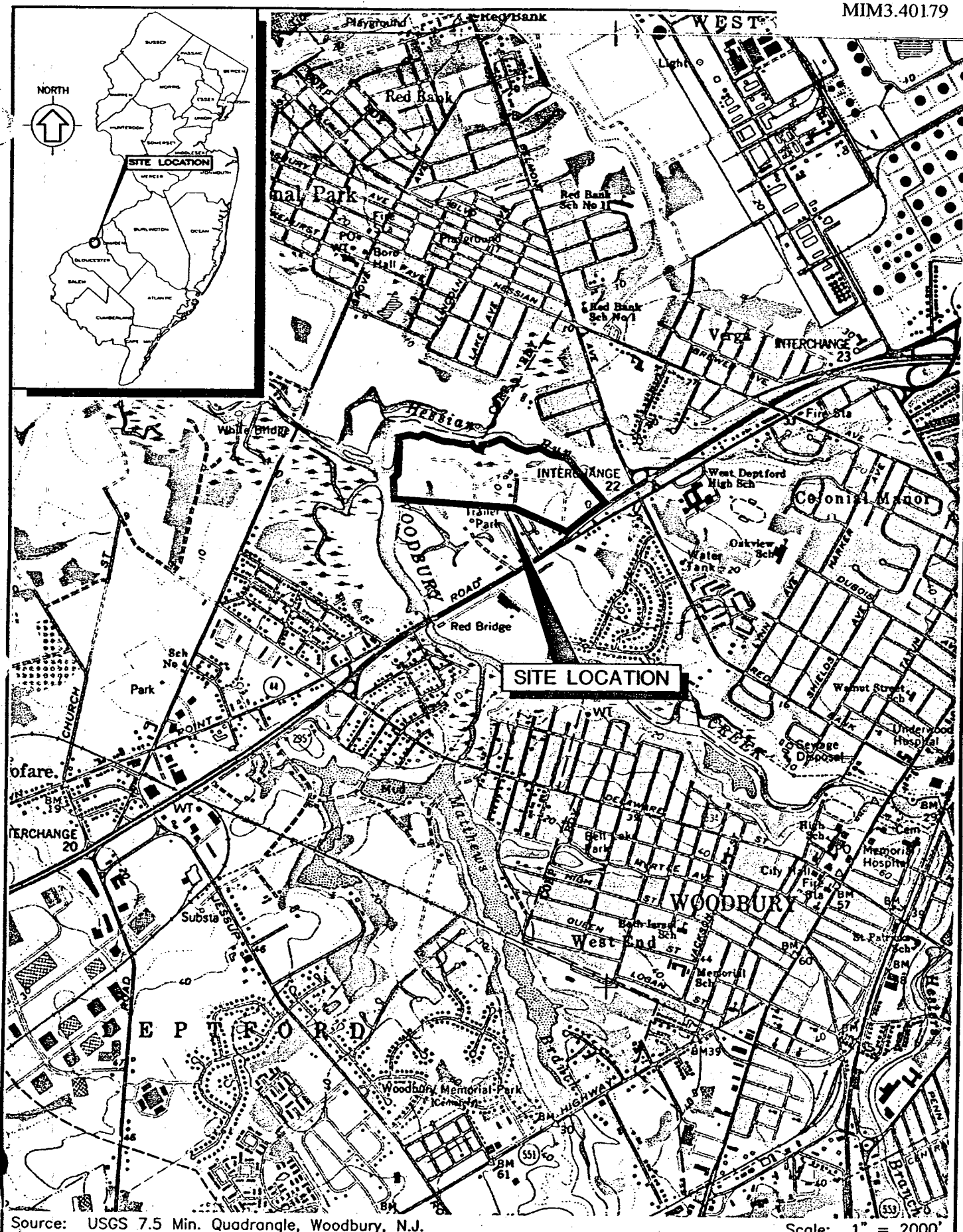
N/A = Data not available

Dom. = Domestic Well

Prod. = Production Well

* No well record found, but potable well identified

FIGURES



N.J. Department
of Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY,
NEW JERSEY
SITE LOCATION MAP
NJDEP CONTRACT No. A-85149

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 1-1



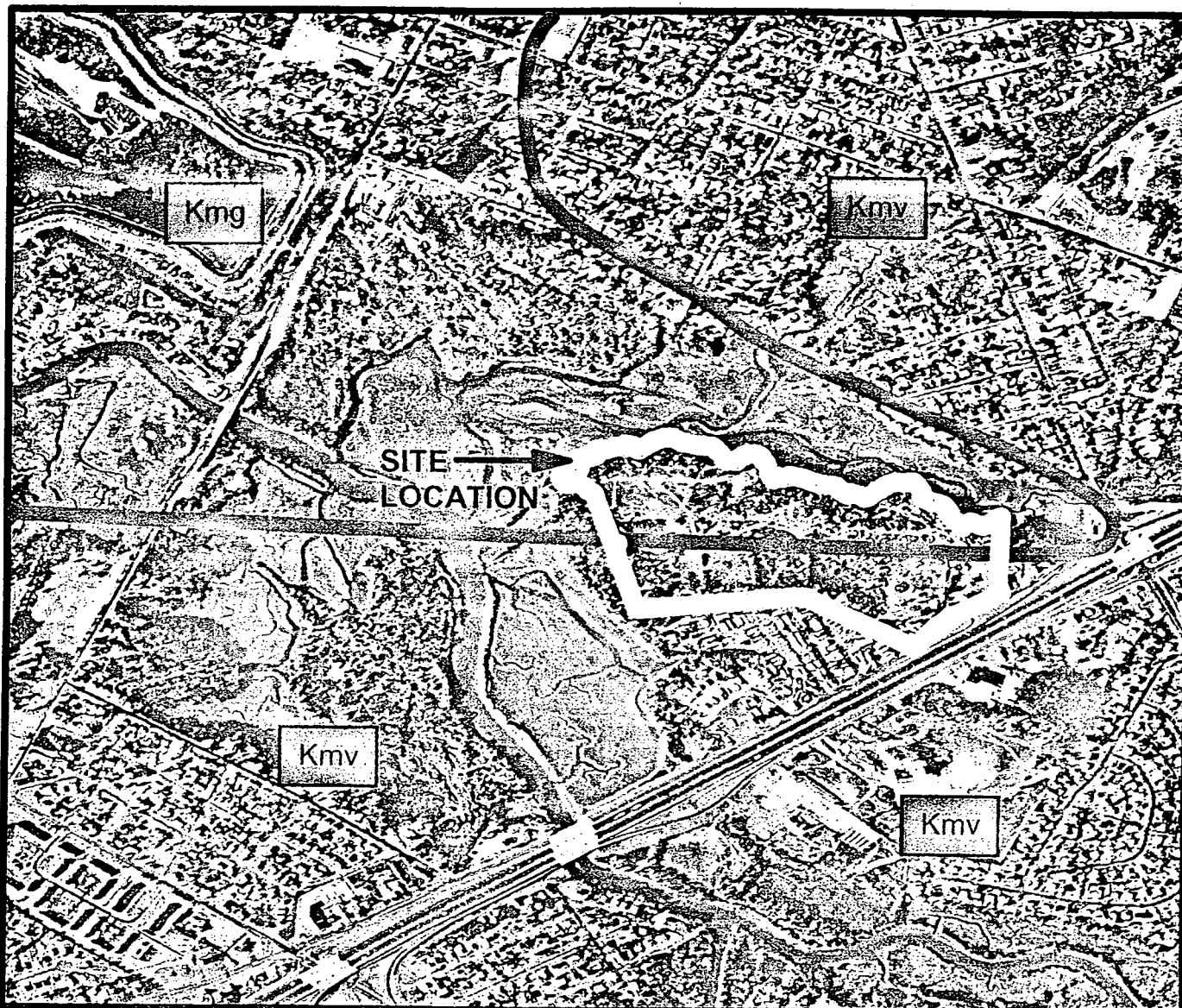
N.J. Department
of Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
SITE PLAN
NJDEP CONTRACT No. A-65449

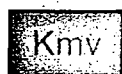
FULL SIZED FIGURE
BOUND SEPARATELY

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

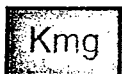
FIGURE 2-1



GEOLOGIC UNITS



Merchantville Formation - Black, glauconitic, micaceous clay, silty clay, and sandy clay. It is massive in structure and greasy in appearance, and weathers to a coherent pale yellow-brown material. (Hardt and Hilton, 1969; Zepczka, 1990; Owens et al, 1995)



Magothy Formation - Light colored, fine to coarse grained beach sand with local beds of dark colored (dark grey to black) lignitic clay (Hardt and Hilton, 1969; Zepczka, 1990; Owens et al, 1995)

SOURCE: 1195/97 Color Infrared Digital Imagery, Plate No. 1142.

SCALE: N.T.S



N.J. Department
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Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY
NEW JERSEY

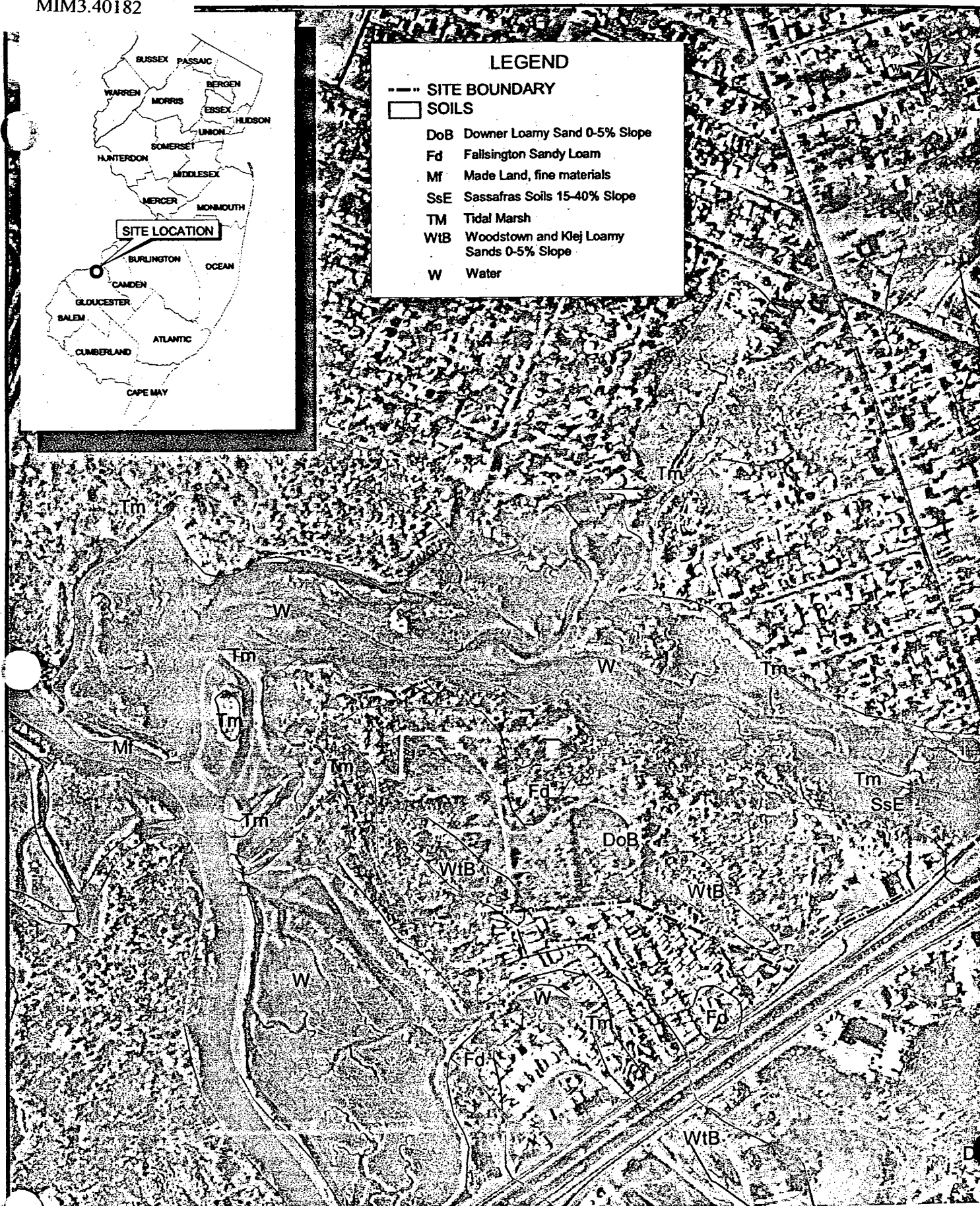
GEOLOGIC MAP

NJDEP CONTRACT No. A-85149

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ



FIGURE 3-2



Source: Gloucester County Soil Survey

Scale: 1" = 600'



N.J. Department
of Environmental
Protection

Matteo Iron and Metals, Gloucester County, New Jersey

SOILS MAP

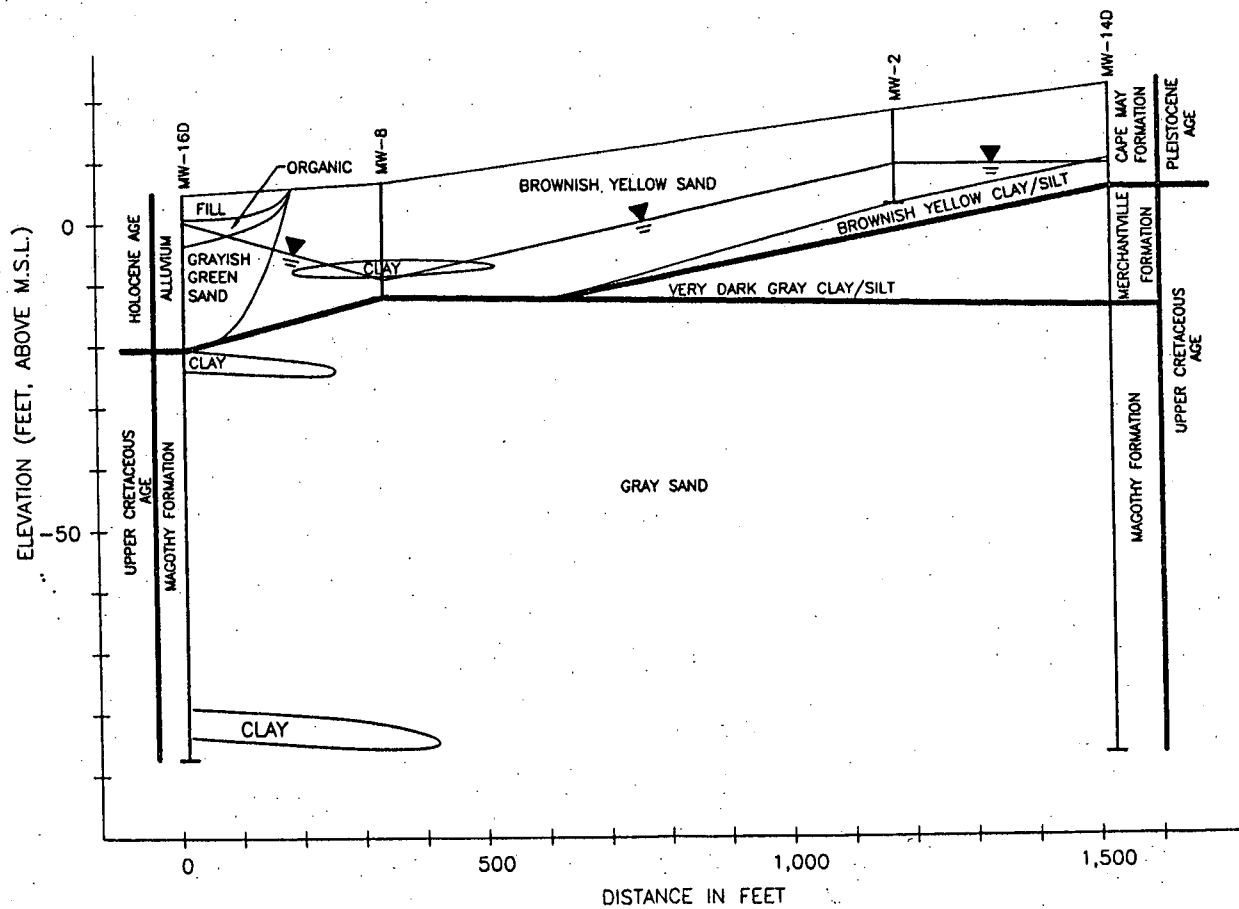
NJDEP CONTRACT No. A-85149

Louis Berger & Assoc.



30 Vreeland Road
Florham Park, NJ

FIGURE
3-1



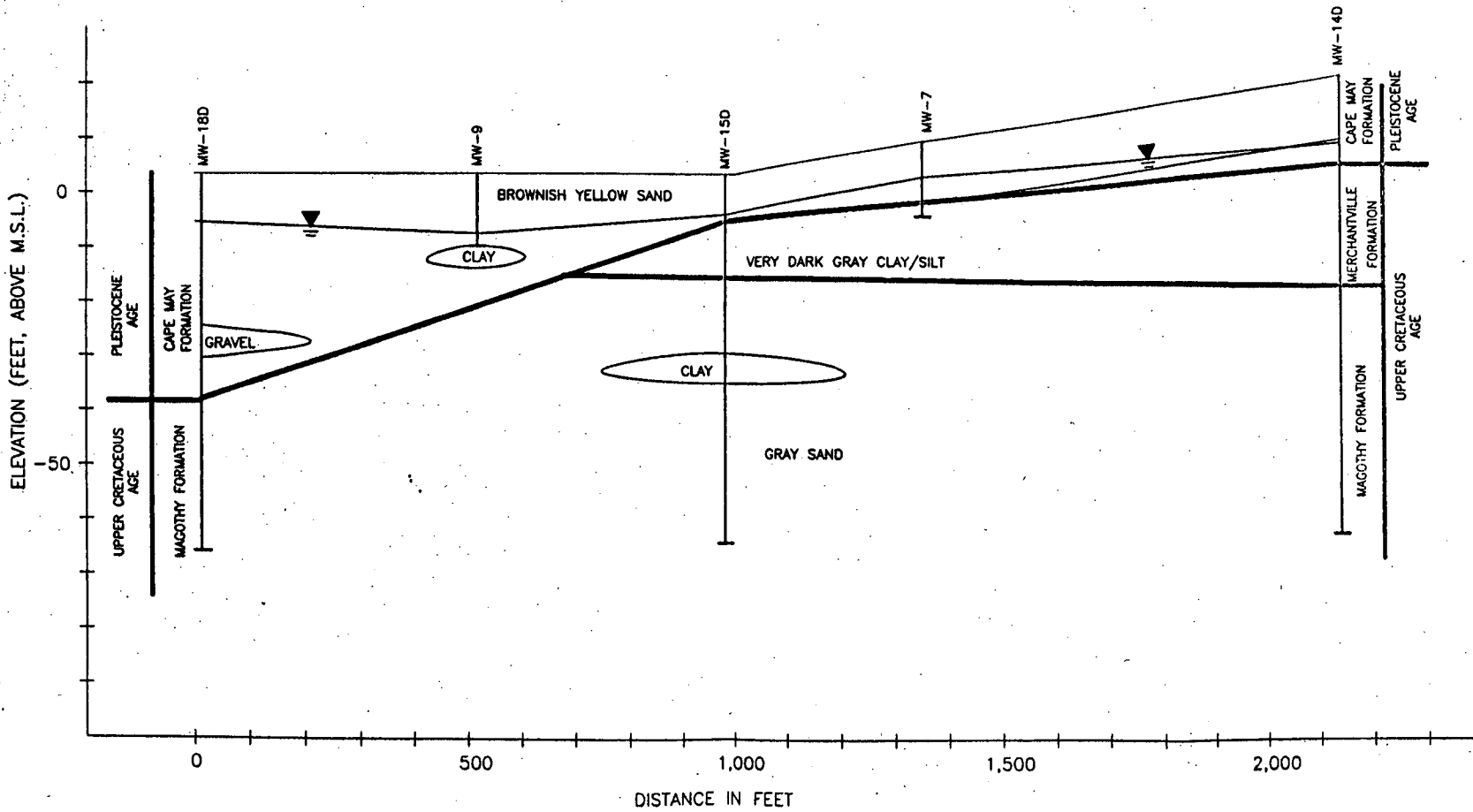
Scale: 1" = 200'

MATTEO IRON AND METALS - GLOUCESTER COUNTY,
NEW JERSEY
GEOLOGICAL CROSS SECTION A-A'
NJDEP CONTRACT No. A-85149

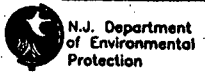
The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 3-3

MIM3.40183



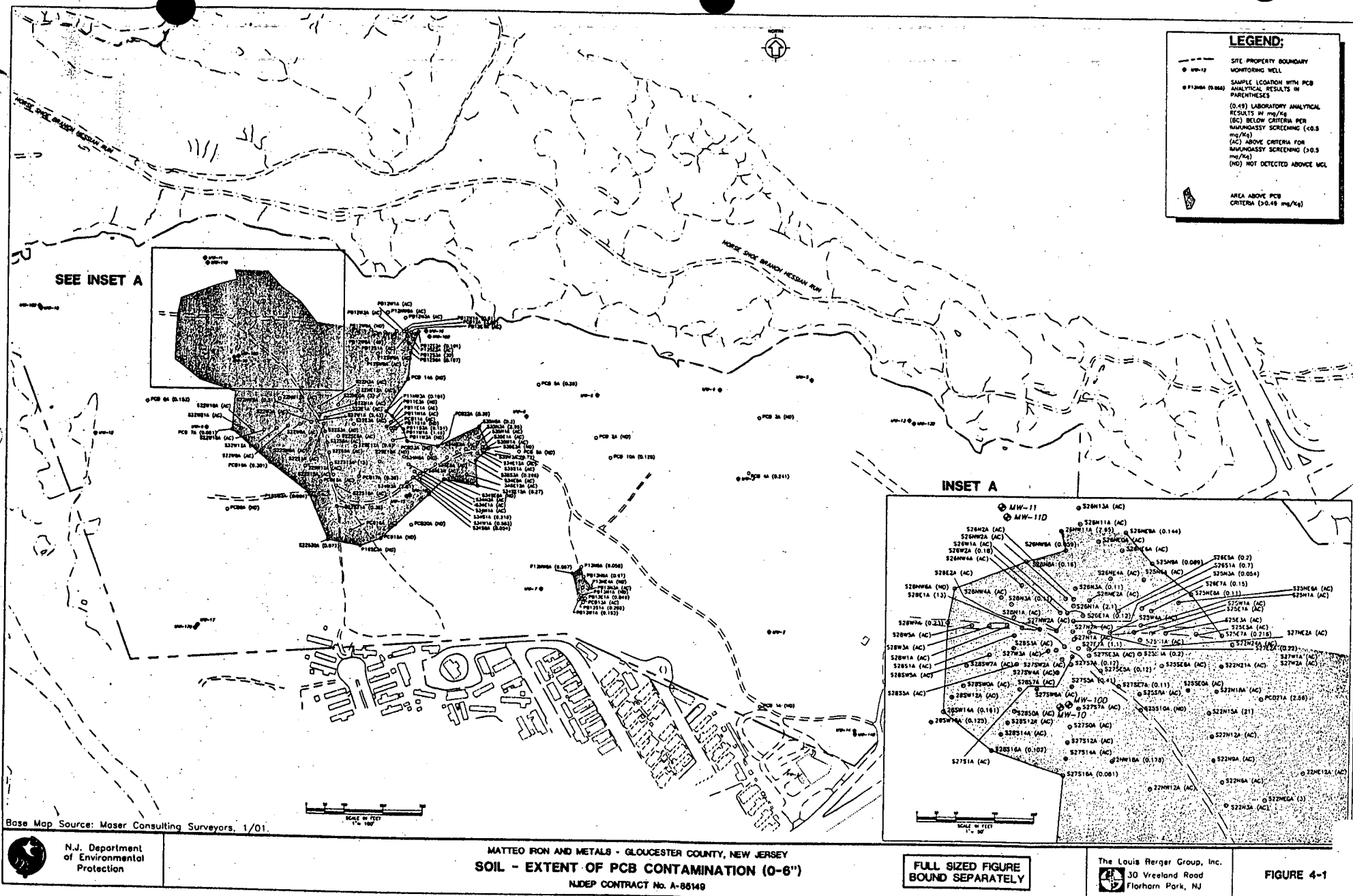
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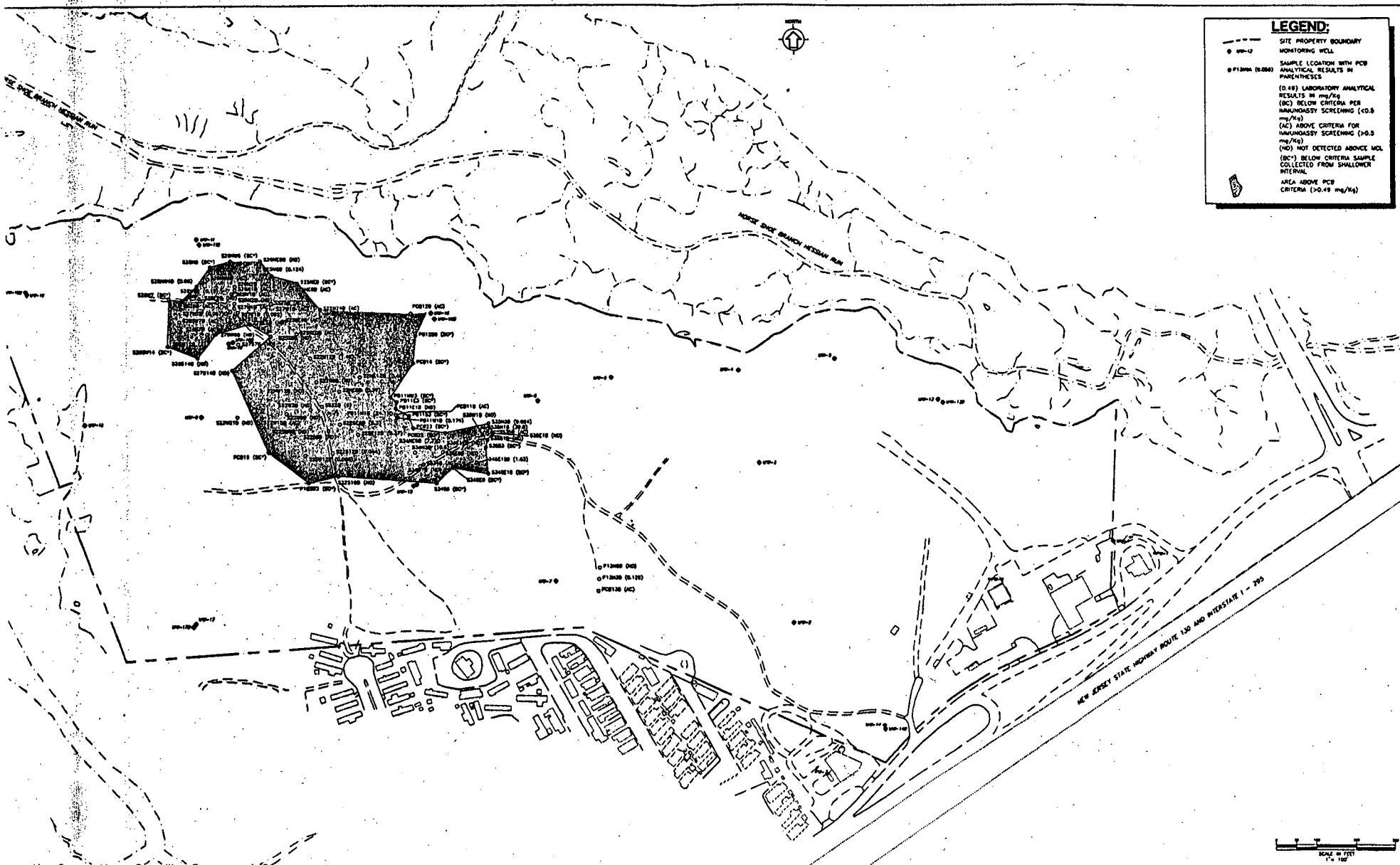


MATTEO IRON AND METALS - GLOUCESTER COUNTY,
NEW JERSEY
GEOLOGICAL CROSS SECTION B-B'
NJDEP CONTRACT No. A-85149

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 3-4





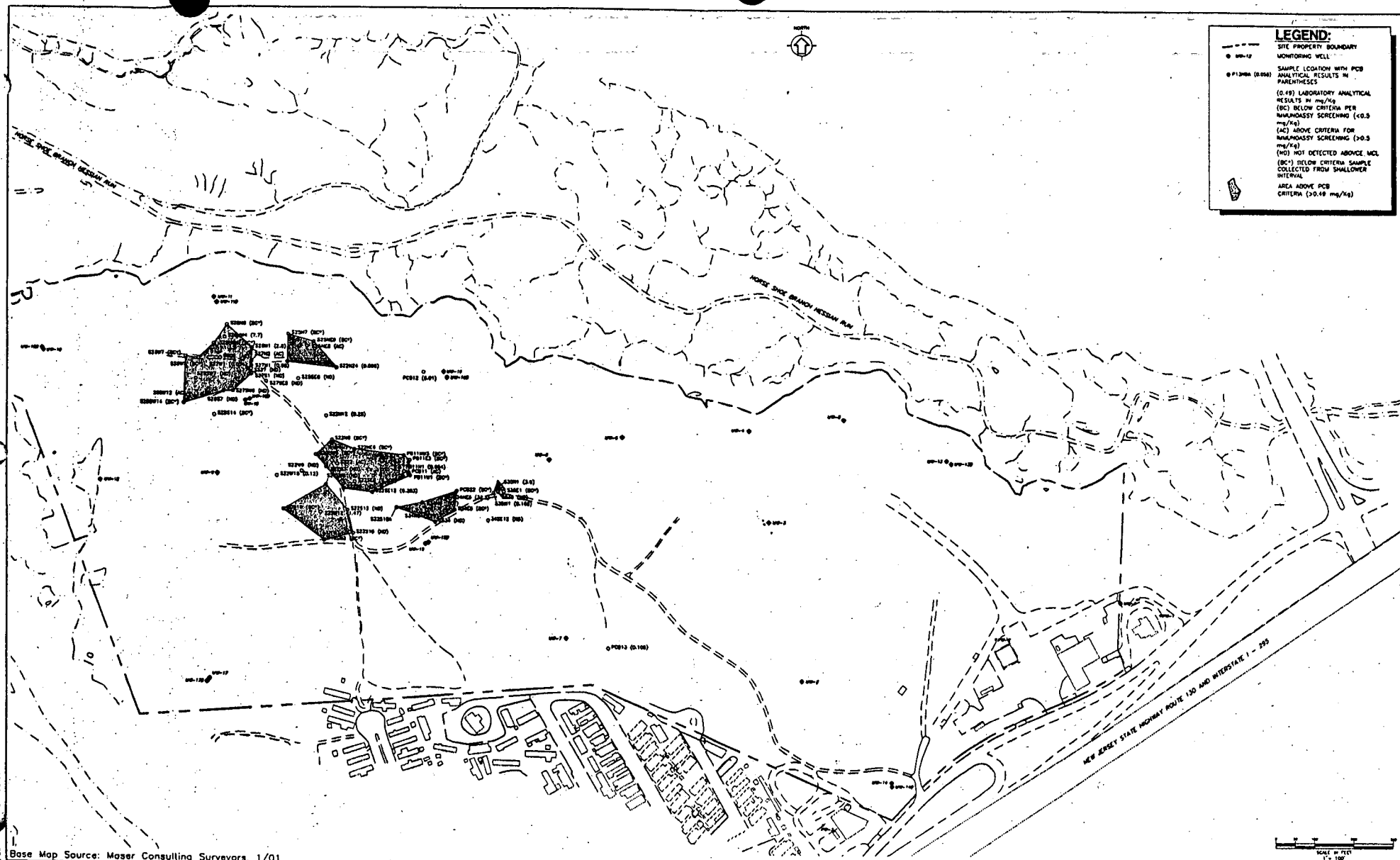
N.J. Department
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Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
SOIL - EXTENT OF PCB CONTAMINATION (12-18")
NJDEP CONTRACT No. A-85149

FULL SIZED FIGURE
BOUND SEPARATELY

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 4-2



LEGEND:

--- SITE PROPERTY BOUNDARY

○ MONITORING WELL

○ P1300A (0.05) SAMPLE LOCATION WITH PCB ANALYTICAL RESULTS IN PARENTHESES

(0.49) LABORATORY ANALYTICAL RESULTS IN mg/kg

(0.05) BELOW CRITERIA PER MINIMUM SCREENING (0.05 mg/kg)

(0.49) ABOVE CRITERIA FOR MINIMUM SCREENING (0.05 mg/kg)

(ND) NOT DETECTED ABOVE MCL

(0.05) BELOW CRITERIA SAMPLE COLLECTED FROM SHALLOWER INTERVAL

AREA ABOVE PCB CRITERIA (0.05 mg/kg)

Base Map Source: Maser Consulting Surveyors, 1/01.



N.J. Department
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MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
SOIL - EXTENT OF PCB CONTAMINATION (24-30")

NJDEP CONTRACT No. A-85140

FULL SIZED FIGURE
BOUND SEPARATELY

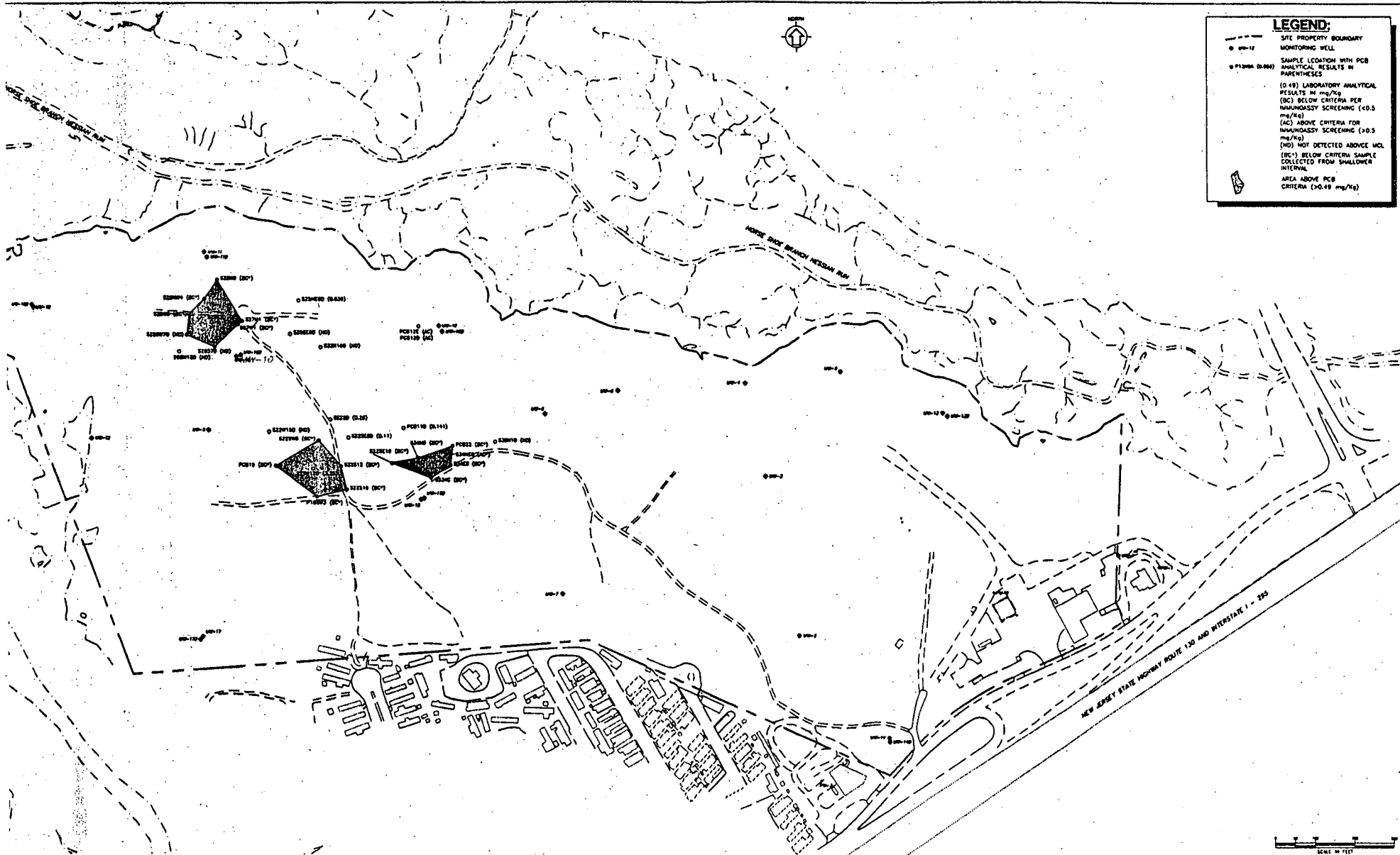
The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 4-3

MIM3.40187

LEGEND:

- SITE PROPERTY BOUNDARY
 ○ MW-12 MONITORING WELL
 ○ P1300A (0.004) SAMPLE LOCATION WITH PCB ANALYTICAL RESULTS IN PARENTHESES
 (0.49) LABORATORY ANALYTICAL RESULTS IN mg/kg
 (BC) BELOW CRITERIA PER NYS/DOH/USEPA SCREENING (<0.5 mg/kg)
 (AC) ABOVE CRITERIA FOR NYS/DOH/USEPA SCREENING (>0.5 mg/kg)
 (ND) NOT DETECTED ABOVE MCL
 (BC-1) BELOW CRITERIA SAMPLE COLLECTED FROM SHALLOWER INTERVAL
 AREA ABOVE PCB CRITERIA (>0.49 mg/kg)



Base Map Source: Moser Consulting Surveyors, 1/01.



N.J. Department
of Environmental
Protection

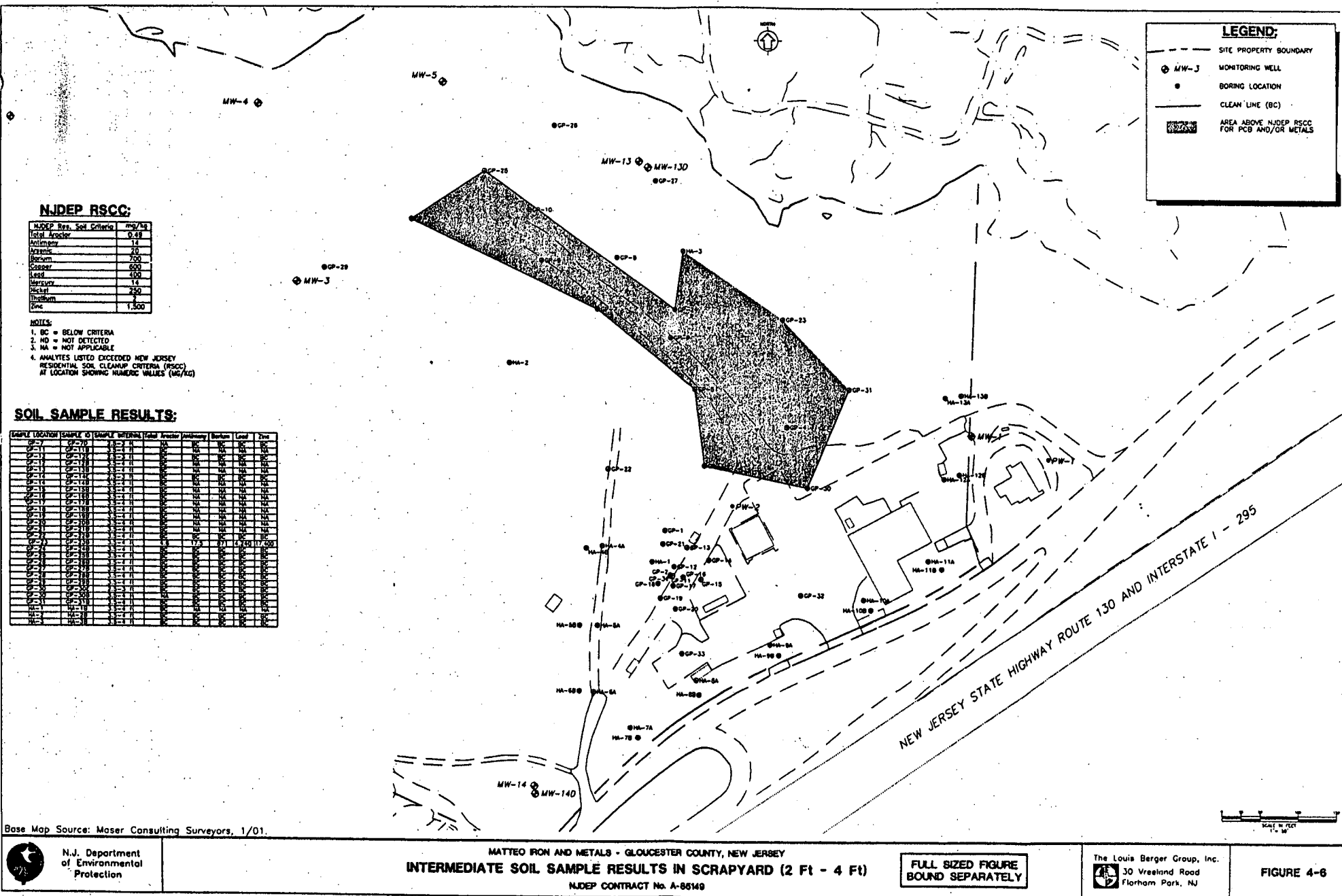
MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
SOIL - EXTENT OF PCB CONTAMINATION (36-42")

NJDEP CONTRACT No. A-85149

FULL SIZED FIGURE
BOUND SEPARATELY

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 4-4



NJDEP RSCC:

NJDEP Res. Soil Criteria	mg/kg
Total Arsenic	15
Antimony	20
Barium	100
Copper	100
Lead	100
Mercury	10
Nickel	100
Thallium	10
Zinc	1,500

NOTES:

1. BC = BELOW CRITERIA
2. ND = NOT DETECTED
3. NA = NOT APPLICABLE
4. ANALYTES LISTED EXCEEDED NEW JERSEY RESIDENTIAL SOIL CLEANUP CRITERIA (RSCC) AT LOCATION SHOWING NUMERIC VALUES (MG/KG)

SAMPLE COLLECTED ABOVE GROUNDWATER.

SOIL SAMPLE RESULTS:

SAMPLE LOCATION	SAMPLE	AS	AN	BA	CU	LE
CP-1	CP-1	15	20	100	100	100
CP-2	CP-2	15	20	100	100	100
CP-3	CP-3	15	20	100	100	100
CP-4	CP-4	15	20	100	100	100
CP-5	CP-5	15	20	100	100	100
CP-6	CP-6	15	20	100	100	100
CP-7	CP-7	15	20	100	100	100
CP-8	CP-8	15	20	100	100	100
CP-9	CP-9	15	20	100	100	100
CP-10	CP-10	15	20	100	100	100
CP-11	CP-11	15	20	100	100	100
CP-12	CP-12	15	20	100	100	100
CP-13	CP-13	15	20	100	100	100
CP-14	CP-14	15	20	100	100	100
CP-15	CP-15	15	20	100	100	100
CP-16	CP-16	15	20	100	100	100
CP-17	CP-17	15	20	100	100	100
CP-18	CP-18	15	20	100	100	100
CP-19	CP-19	15	20	100	100	100
CP-20	CP-20	15	20	100	100	100
CP-21	CP-21	15	20	100	100	100
CP-22	CP-22	15	20	100	100	100
CP-23	CP-23	15	20	100	100	100
CP-24	CP-24	15	20	100	100	100
CP-25	CP-25	15	20	100	100	100
CP-26	CP-26	15	20	100	100	100
CP-27	CP-27	15	20	100	100	100
CP-28	CP-28	15	20	100	100	100
CP-29	CP-29	15	20	100	100	100
CP-30	CP-30	15	20	100	100	100
CP-31	CP-31	15	20	100	100	100
CP-32	CP-32	15	20	100	100	100
CP-33	CP-33	15	20	100	100	100
CP-34	CP-34	15	20	100	100	100
CP-35	CP-35	15	20	100	100	100
CP-36	CP-36	15	20	100	100	100
CP-37	CP-37	15	20	100	100	100
CP-38	CP-38	15	20	100	100	100
CP-39	CP-39	15	20	100	100	100
CP-40	CP-40	15	20	100	100	100
CP-41	CP-41	15	20	100	100	100
CP-42	CP-42	15	20	100	100	100
CP-43	CP-43	15	20	100	100	100
CP-44	CP-44	15	20	100	100	100
CP-45	CP-45	15	20	100	100	100
CP-46	CP-46	15	20	100	100	100
CP-47	CP-47	15	20	100	100	100
CP-48	CP-48	15	20	100	100	100
CP-49	CP-49	15	20	100	100	100
CP-50	CP-50	15	20	100	100	100
CP-51	CP-51	15	20	100	100	100
CP-52	CP-52	15	20	100	100	100
CP-53	CP-53	15	20	100	100	100
CP-54	CP-54	15	20	100	100	100
CP-55	CP-55	15	20	100	100	100
CP-56	CP-56	15	20	100	100	100
CP-57	CP-57	15	20	100	100	100
CP-58	CP-58	15	20	100	100	100
CP-59	CP-59	15	20	100	100	100
CP-60	CP-60	15	20	100	100	100
CP-61	CP-61	15	20	100	100	100
CP-62	CP-62	15	20	100	100	100
CP-63	CP-63	15	20	100	100	100
CP-64	CP-64	15	20	100	100	100
CP-65	CP-65	15	20	100	100	100
CP-66	CP-66	15	20	100	100	100
CP-67	CP-67	15	20	100	100	100
CP-68	CP-68	15	20	100	100	100
CP-69	CP-69	15	20	100	100	100
CP-70	CP-70	15	20	100	100	100
CP-71	CP-71	15	20	100	100	100
CP-72	CP-72	15	20	100	100	100
CP-73	CP-73	15	20	100	100	100
CP-74	CP-74	15	20	100	100	100
CP-75	CP-75	15	20	100	100	100
CP-76	CP-76	15	20	100	100	100
CP-77	CP-77	15	20	100	100	100
CP-78	CP-78	15	20	100	100	100
CP-79	CP-79	15	20	100	100	100
CP-80	CP-80	15	20	100	100	100
CP-81	CP-81	15	20	100	100	100
CP-82	CP-82	15	20	100	100	100
CP-83	CP-83	15	20	100	100	100
CP-84	CP-84	15	20	100	100	100
CP-85	CP-85	15	20	100	100	100
CP-86	CP-86	15	20	100	100	100
CP-87	CP-87	15	20	100	100	100
CP-88	CP-88	15	20	100	100	100
CP-89	CP-89	15	20	100	100	100
CP-90	CP-90	15	20	100	100	100
CP-91	CP-91	15	20	100	100	100
CP-92	CP-92	15	20	100	100	100
CP-93	CP-93	15	20	100	100	100
CP-94	CP-94	15	20	100	100	100
CP-95	CP-95	15	20	100	100	100
CP-96	CP-96	15	20	100	100	100
CP-97	CP-97	15	20	100	100	100
CP-98	CP-98	15	20	100	100	100
CP-99	CP-99	15	20	100	100	100
CP-100	CP-100	15	20	100	100	100

Base Map Source: Maser Consulting Surveyors, 1/01.



N.J. Department
of Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
DEEP SOIL SAMPLE RESULTS IN SCRAPYARD (10 Ft - 12 Ft)
NJDEP CONTRACT No. A-85148

FULL SIZED FIGURE
BOUND SEPARATELY

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Florham Park, NJ

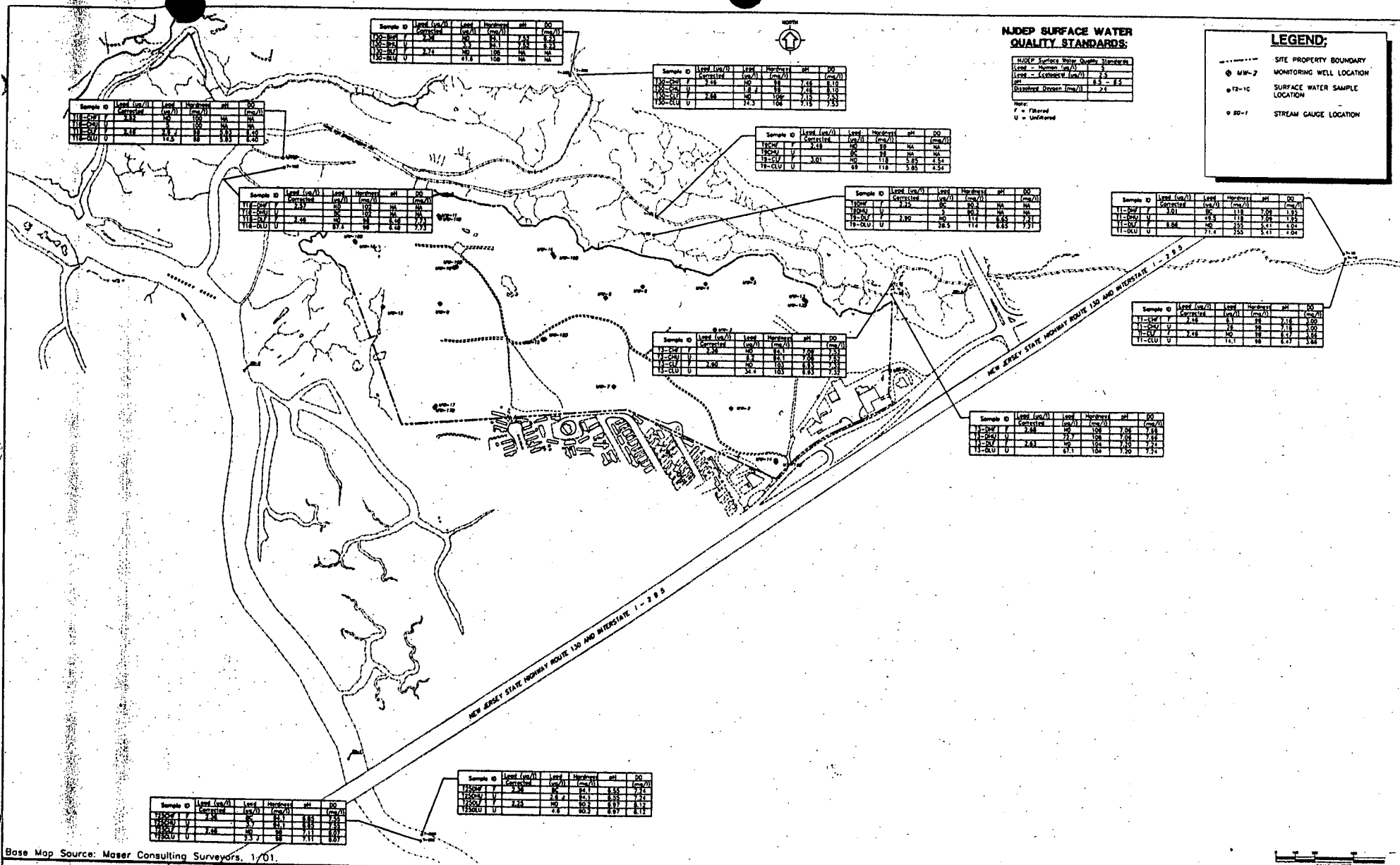
FIGURE 4-7

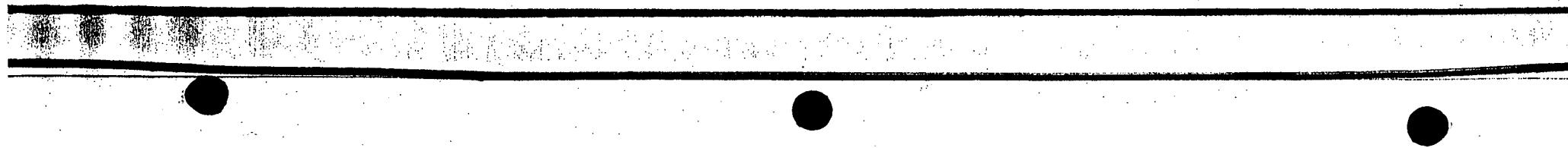
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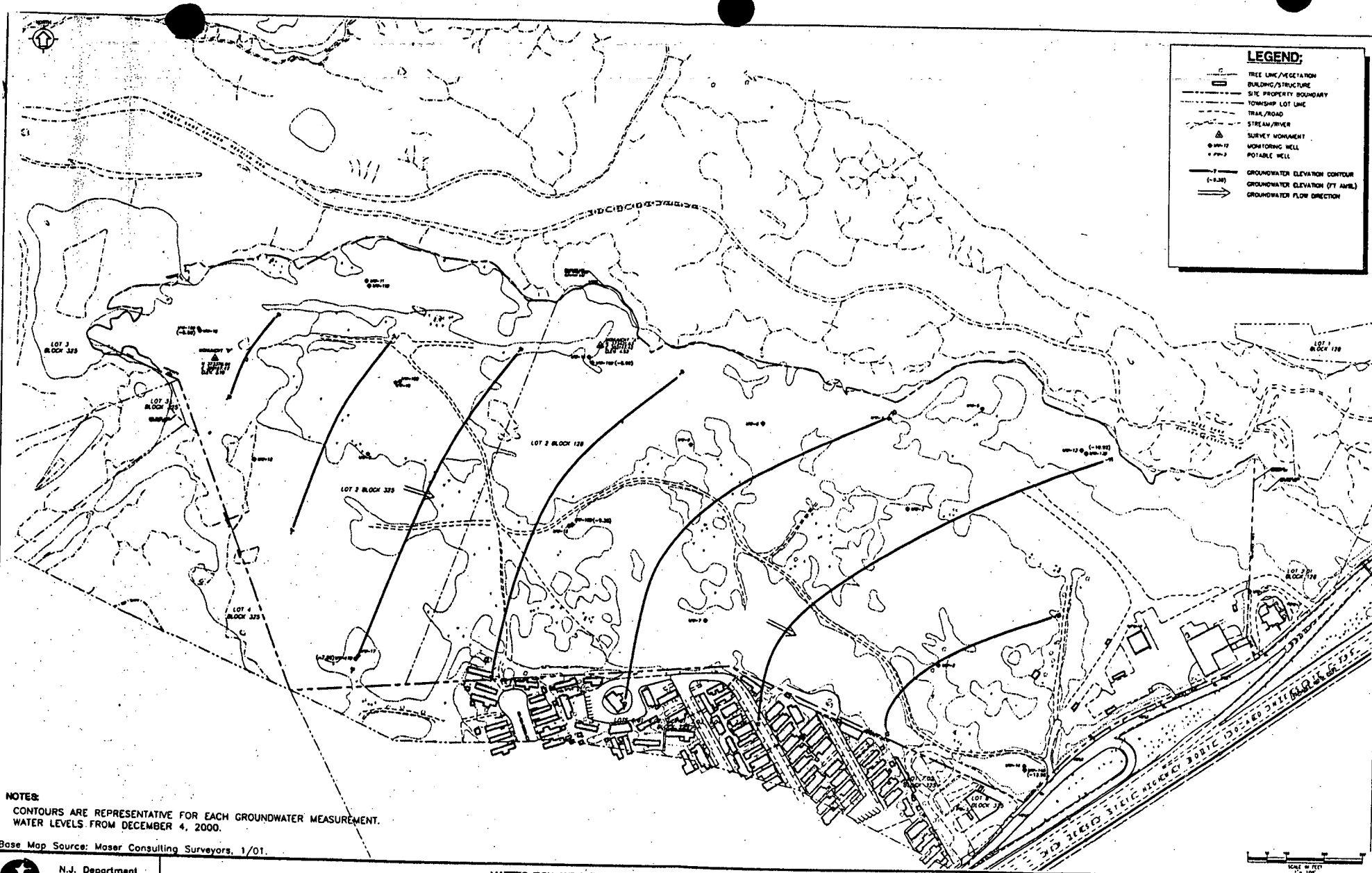
NOTES:

- 1. SHADING INDICATES SUPPLEMENTAL RI SAMPLE INFORMATION.
- 2. ALL UNITS ARE MG/KG, UNLESS OTHERWISE NOTED.
- 3. ANALYTES LISTED EXCEEDED NEW JERSEY RESIDENTIAL SOIL CLEANUP CRITERIA (RSCC) UNLESS OTHERWISE NOTED.
- 4. * ANALYTES EXCEEDED NEW JERSEY IMPACT TO GROUND WATER CLEANUP CRITERIA (IGW).
- 5. ** ANALYTES COMPARED TO RCRA STANDARD (40 CFR POST 201) AT LOCATIONS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. UNITS ARE MG/L.
- 6. BC = BELOW CRITERIA.
- 7. ND = NOT DETECTED.
- 8. J = ESTIMATED.
- 9. D = DILUTED.

Base Map Source: Moser Consulting Surveyors, 1/01.

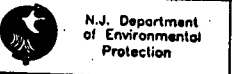






NOTES:
 CONTOURS ARE REPRESENTATIVE FOR EACH GROUNDWATER MEASUREMENT.
 WATER LEVELS FROM DECEMBER 4, 2000.

Base Map Source: Maser Consulting Surveyors, 1/01.



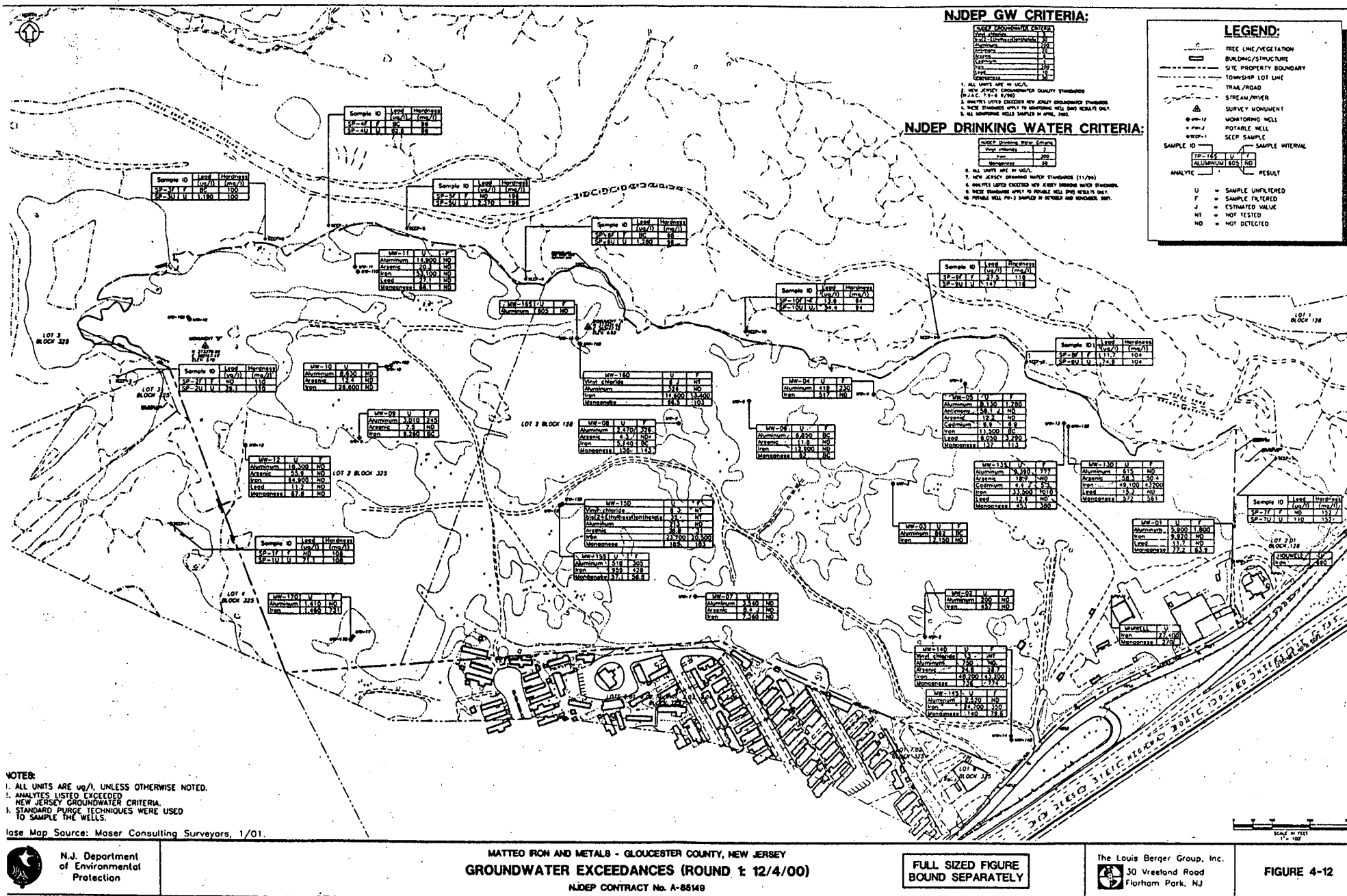
MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
DEEP GROUNDWATER ELEVATION CONTOUR MAP - 12/4/00
 NJDEP CONTRACT No. A-65149

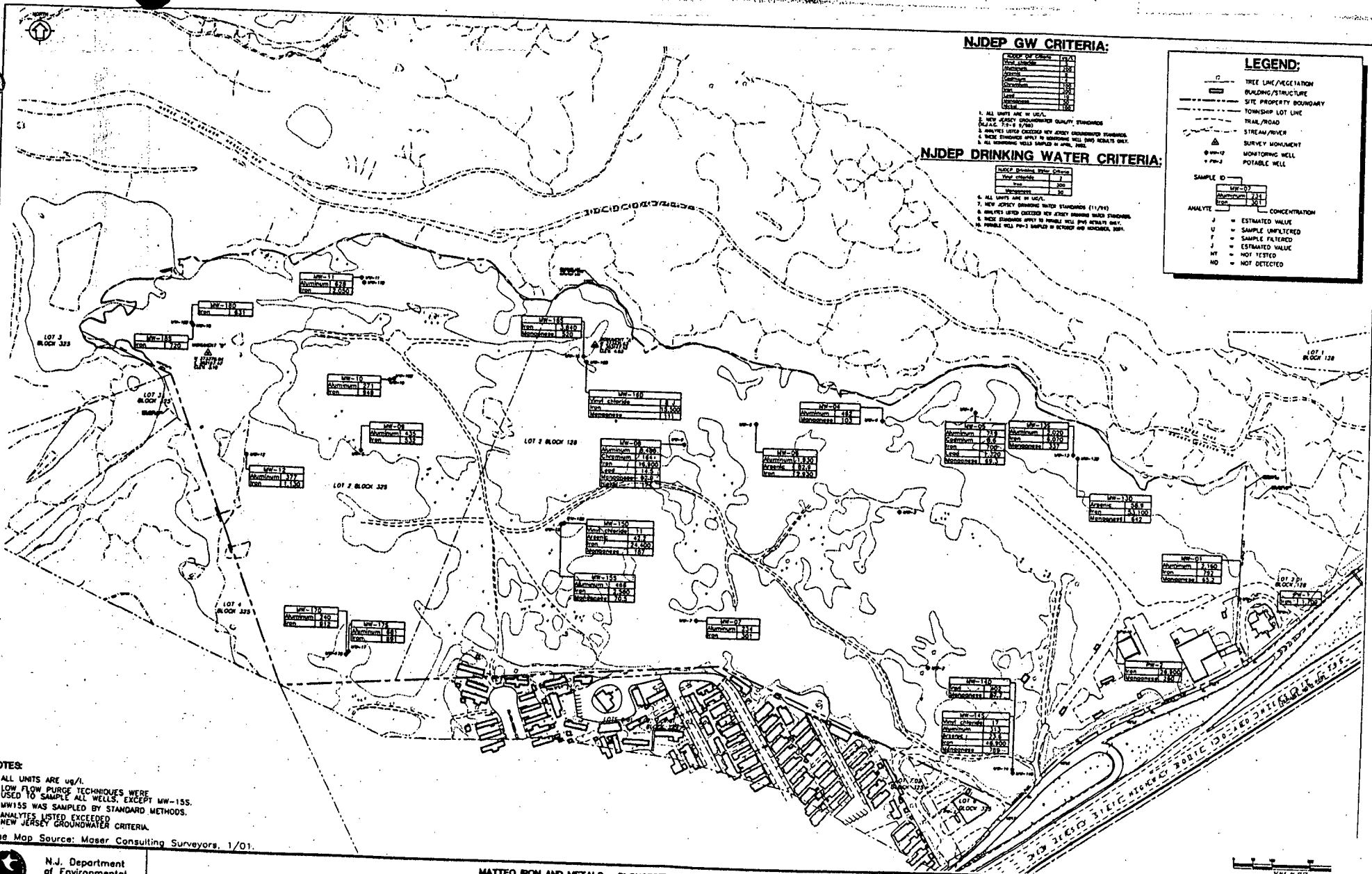
FULL SIZED FIGURE
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FIGURE 4-11

MIM3.40195





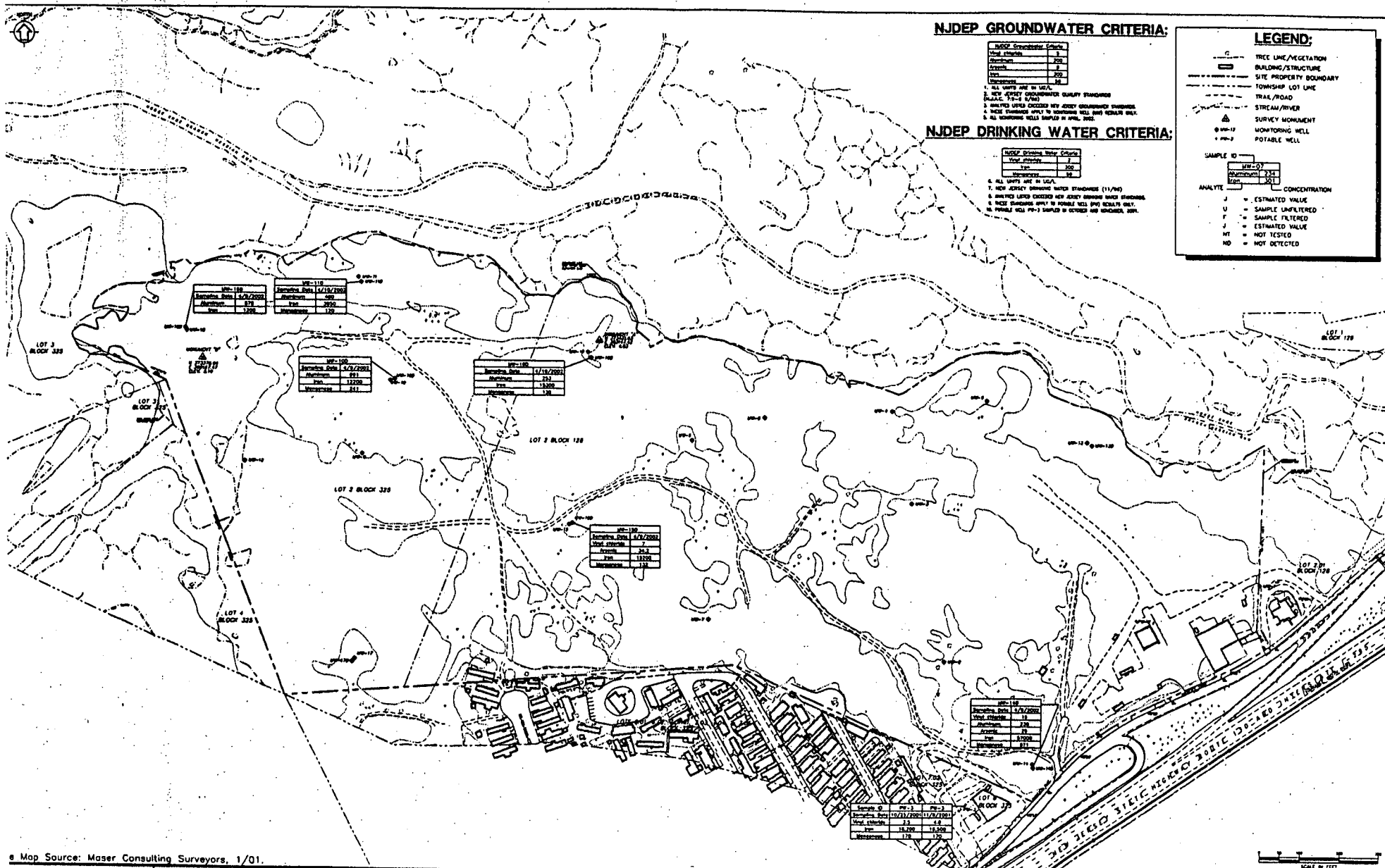
MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
GROUNDWATER EXCEEDANCES (ROUND 2: 1/26/01)
NJDEP CONTRACT No. A-85149

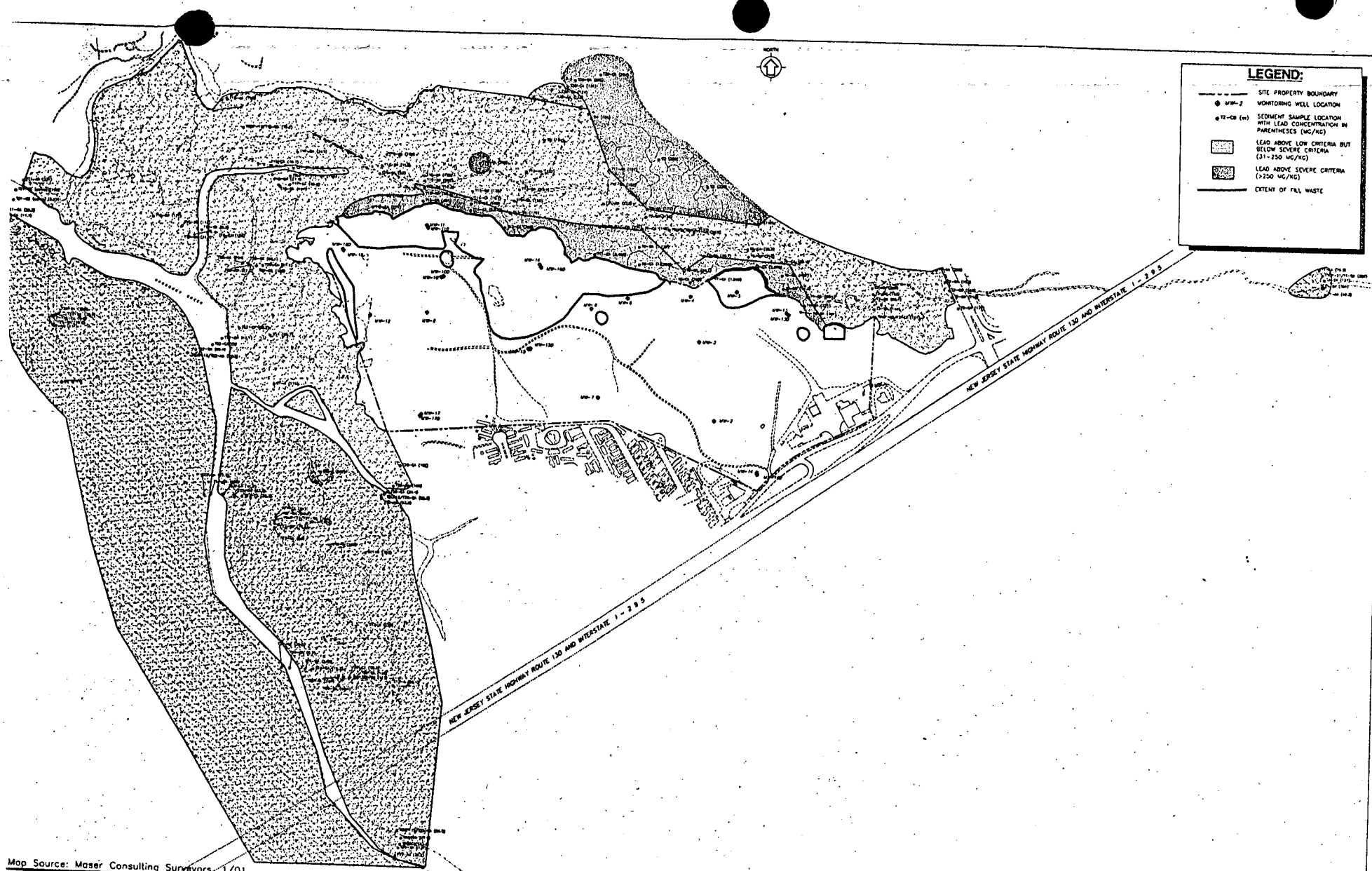
FULL SIZED FIGURE
BOUND SEPARATELY

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Florham Park, NJ

FIGURE 4-13

MIM3.40197

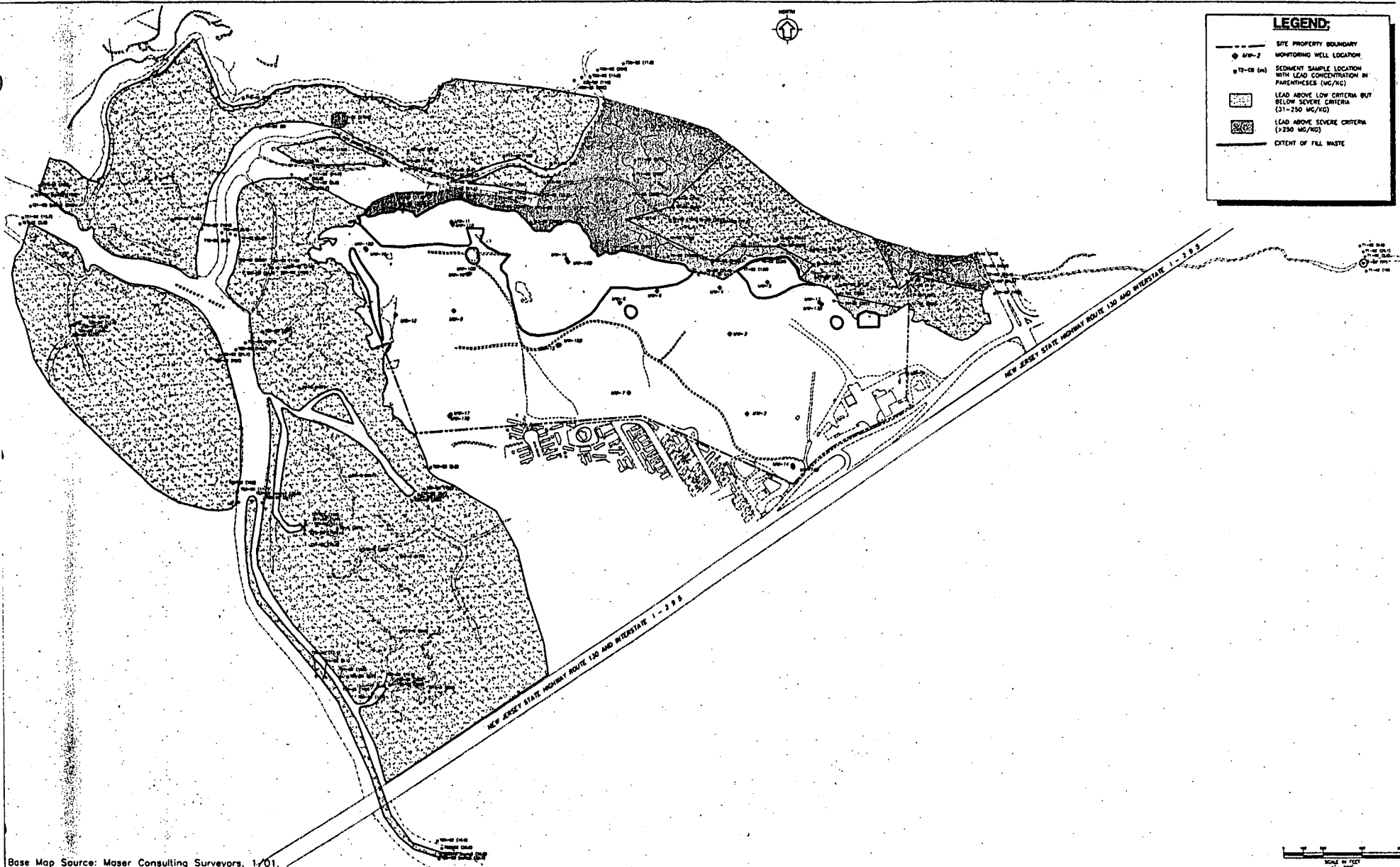


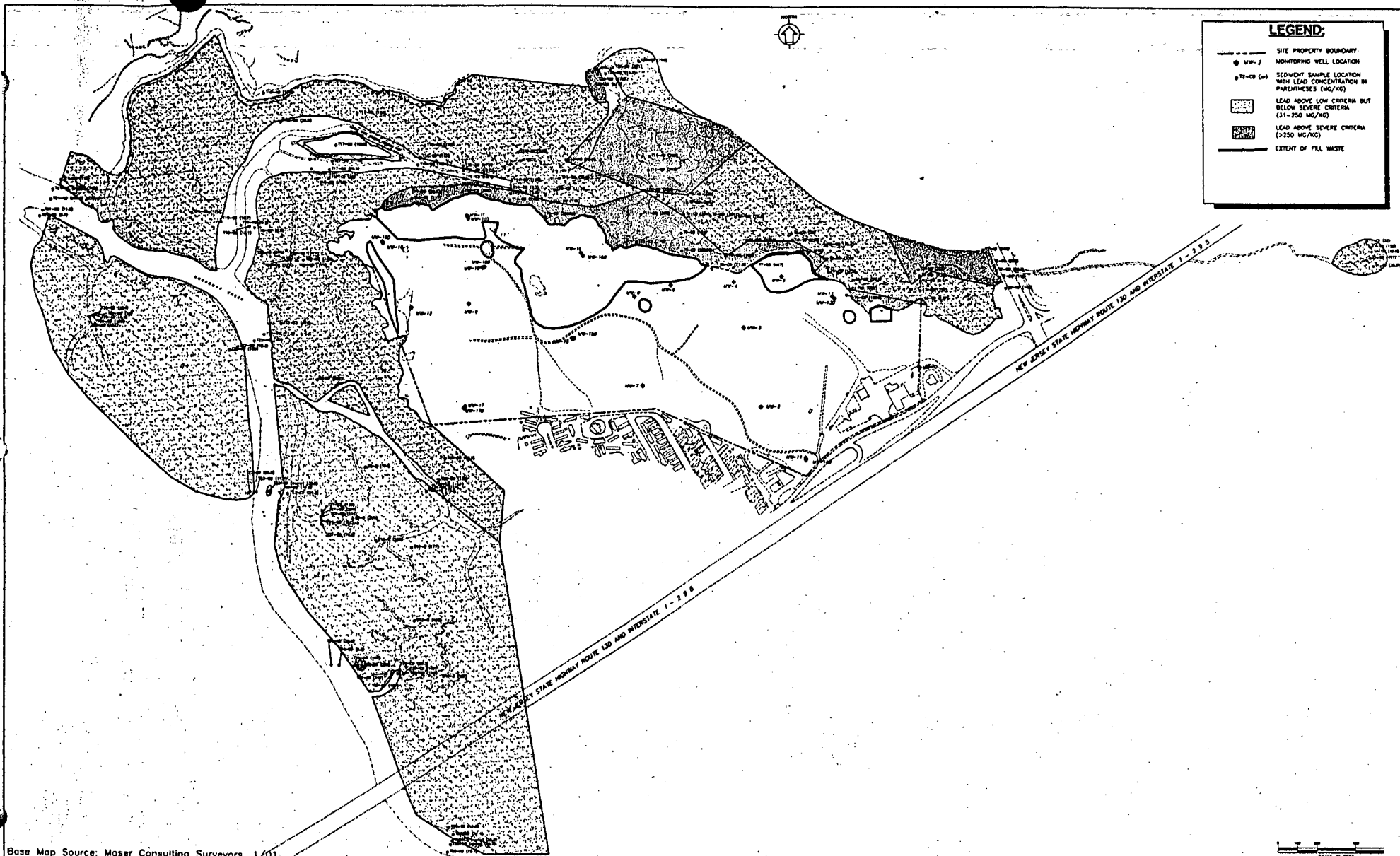


Map Source: Maser Consulting Surveyors, 1/01.

<p>N.J. Department of Environmental Protection</p>	<p>MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY</p> <p>SEDIMENT - EXTENT OF LEAD CONTAMINATION (0-6")</p> <p>NJDEP CONTRACT No. A-85149</p>	<p>FULL SIZED FIGURE BOUND SEPARATELY</p>	<p>The Louis Berger Group, Inc. 30 Vreeland Road Florham Park, NJ</p>	<p>FIGURE 4-15</p>
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MIM3.40199





Base Map Source: Maser Consulting Surveyors, 1/01.



N.J. Department
of Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
SEDIMENT - EXTENT OF LEAD CONTAMINATION (12-24")

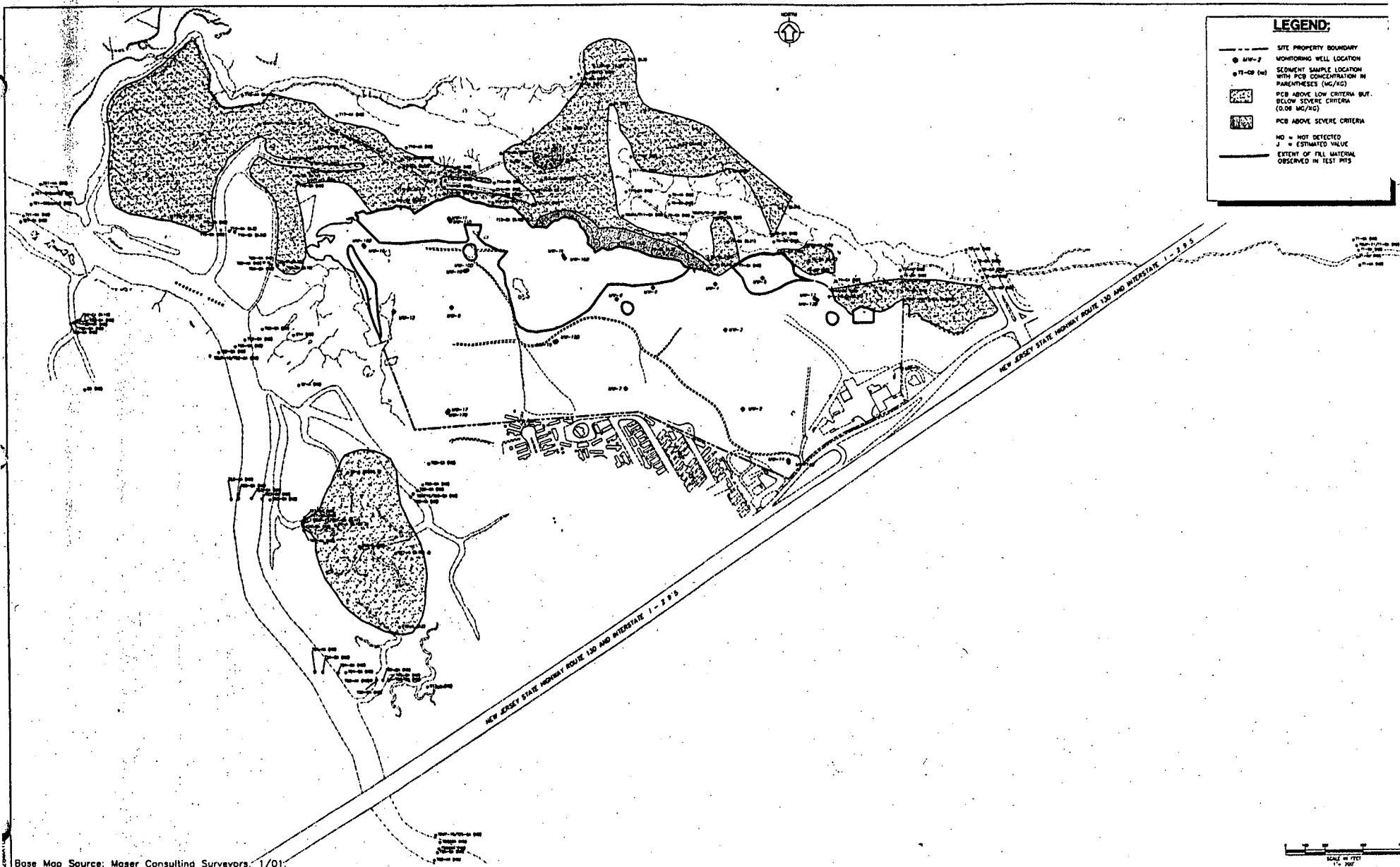
NJDEP CONTRACT No. A-65148

FULL SIZED FIGURE
BOUND SEPARATELY

The Louis Berger Group, Inc.
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Florham Park, NJ

FIGURE 4-18

MIM3.40201



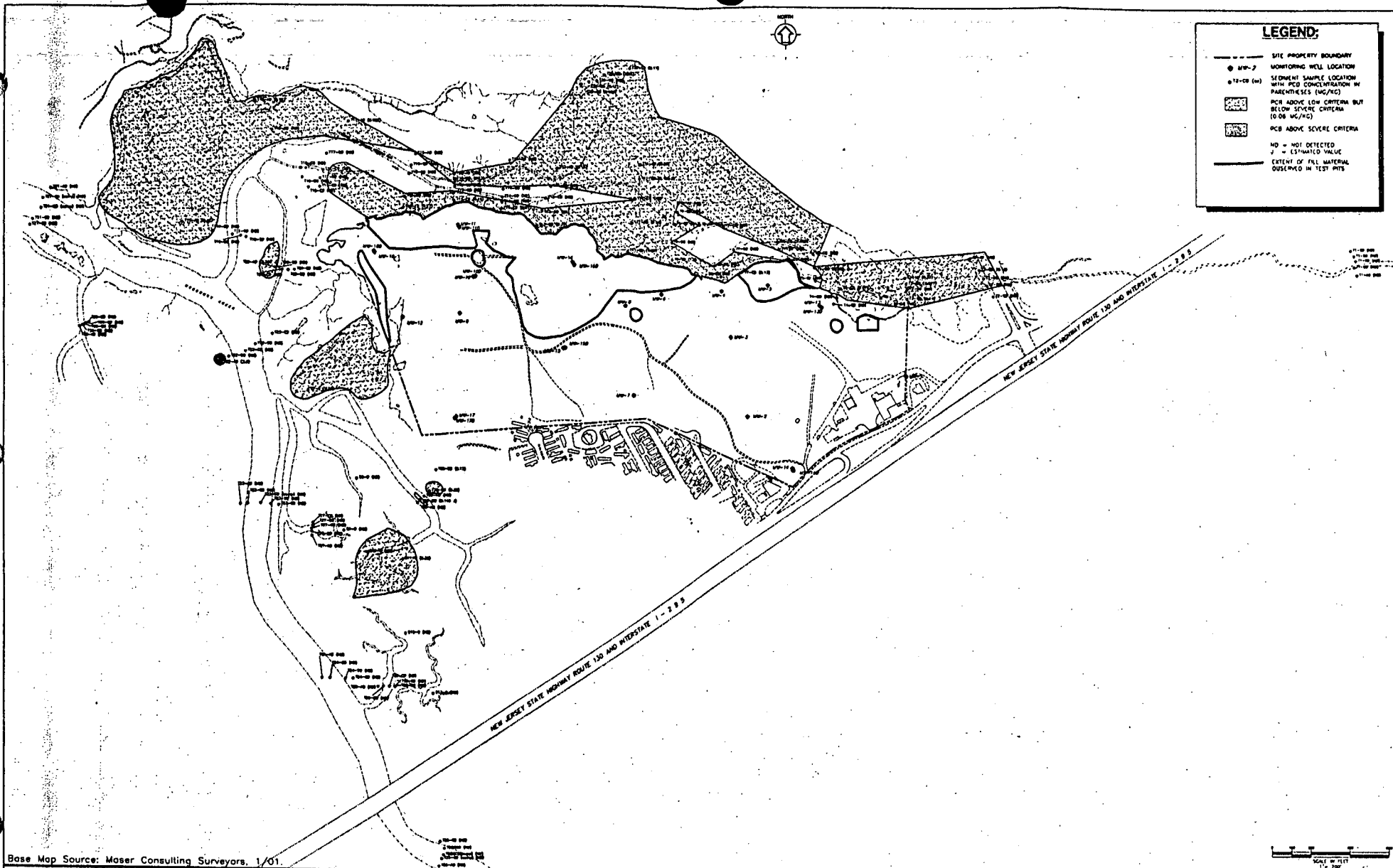
N.J. Department
of Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
SEDIMENT - EXTENT OF PCB AROCLOR 1254 CONTAMINATION (0-6")
NJDEP CONTRACT No. A-85149

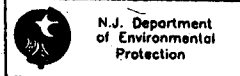
FULL SIZED FIGURE
BOUND SEPARATELY

The Louis Berger Group, Inc.
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Florham Park, NJ

FIGURE 4-18



Base Map Source: Moser Consulting Surveyors, 1/01.



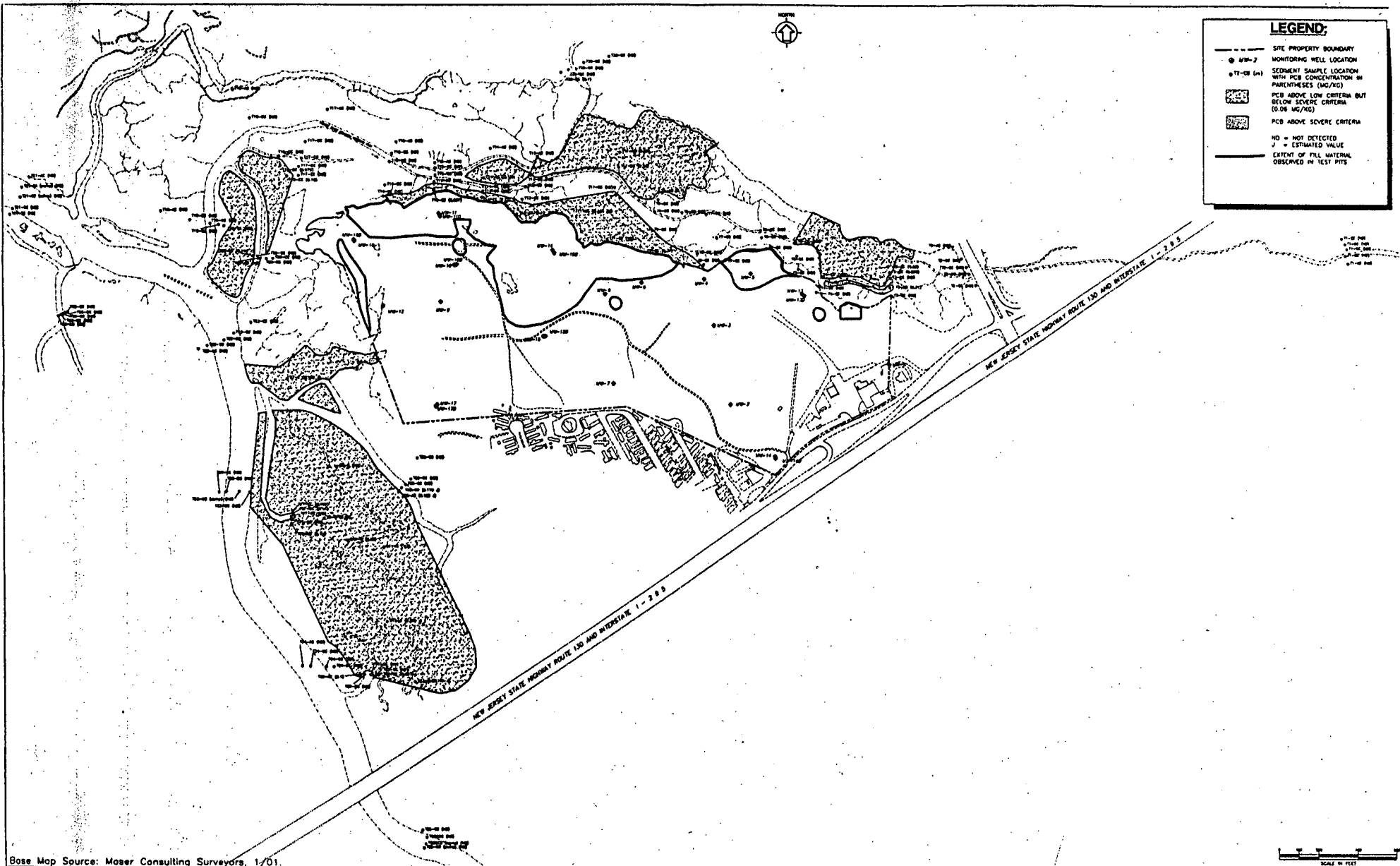
MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
 SEDIMENT - EXTENT OF PCB AROCLOR 1254 CONTAMINATION (12-24")
 NJDEP CONTRACT No. A-85149

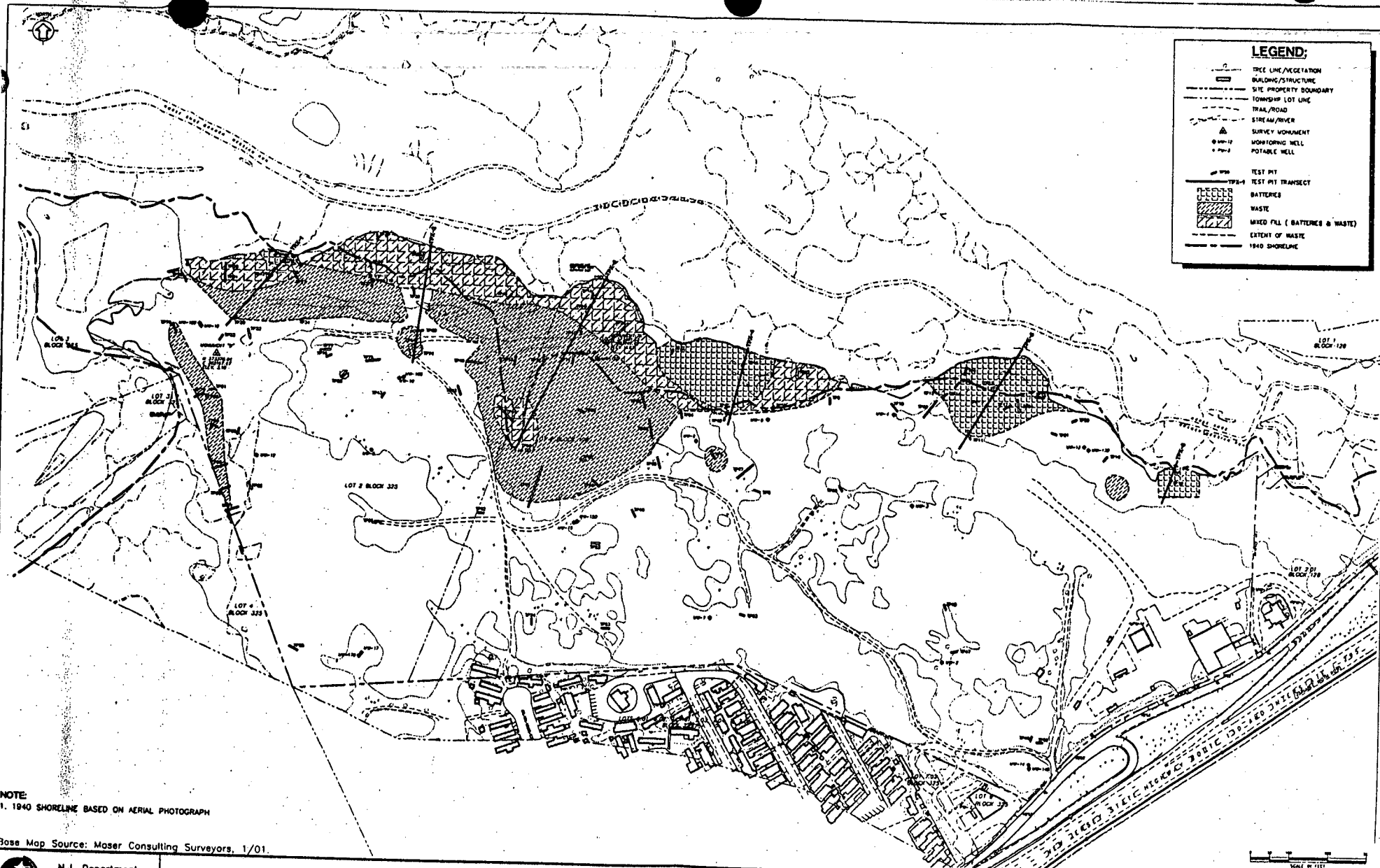
FULL SIZED FIGURE
 BOUND SEPARATELY

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FIGURE 4-1

MIM3.40203





NOTE:
1. 1940 SHORELINE BASED ON AERIAL PHOTOGRAPH

Base Map Source: Moser Consulting Surveyors, 1/01.



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of Environmental
Protection

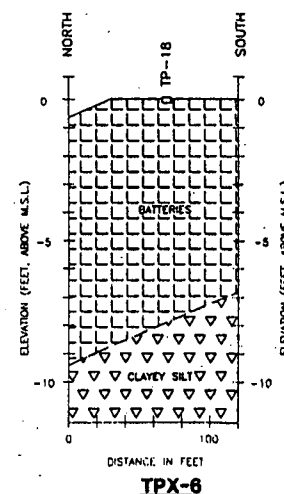
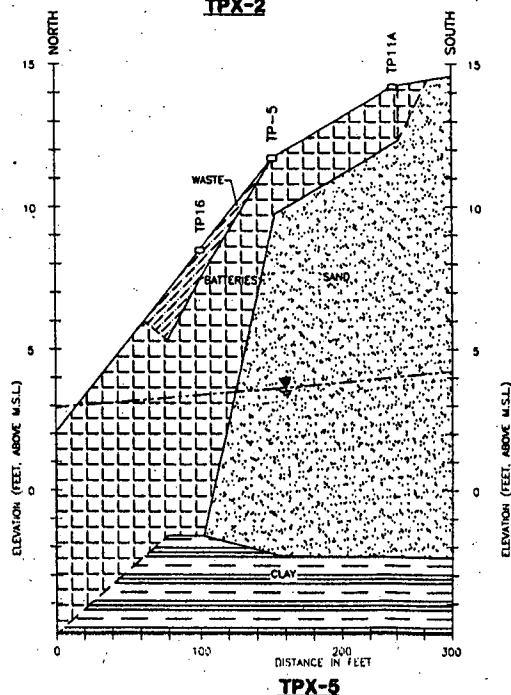
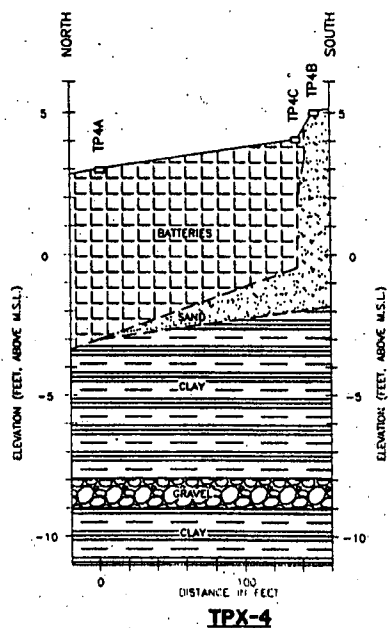
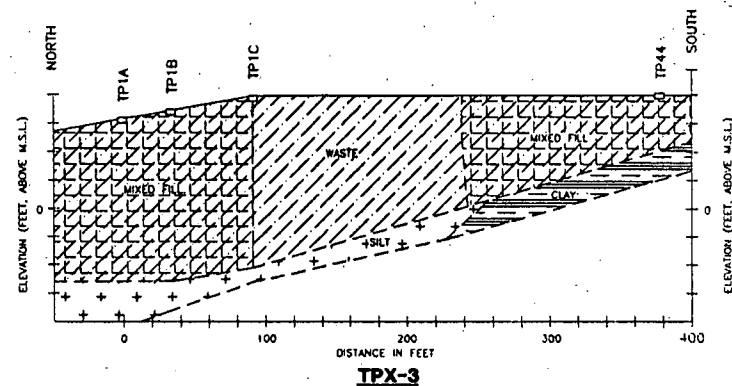
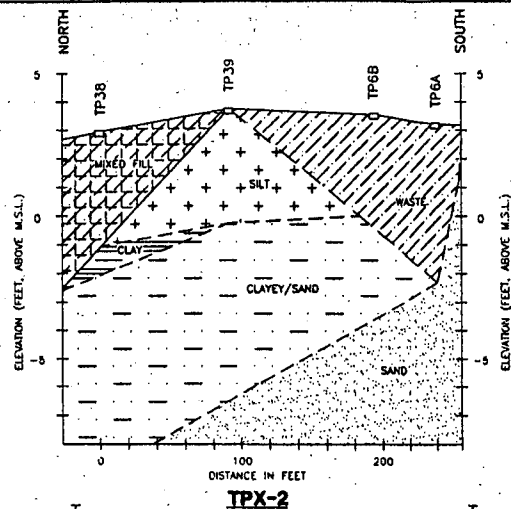
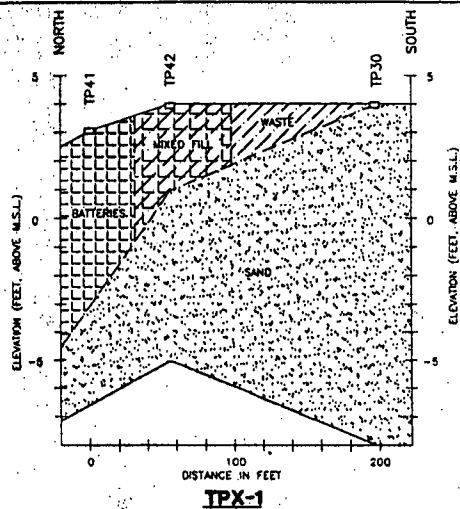
MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
EXTENT OF WASTE OBSERVED IN TEST PITS
NJDEP CONTRACT No. A-85149

FULL SIZED FIGURE
BOUND SEPARATELY

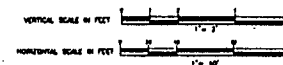
The Louis Berger Group, Inc.
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Florham Park, NJ

FIGURE 5-1

MIM3.40205

**LEGEND:**

- WATER TABLE
- STRATA LINES DASHED WHERE INFERRED
- BATTERIES
- MIXED FILL (BATTERIES AND WASTE)
- WASTE
- SAND
- CLAY
- GRAVEL
- CLAYEY SILT



NOTE:
FOR LOCATION OF CROSS SECTION TRANSECTS, SEE FIGURE.



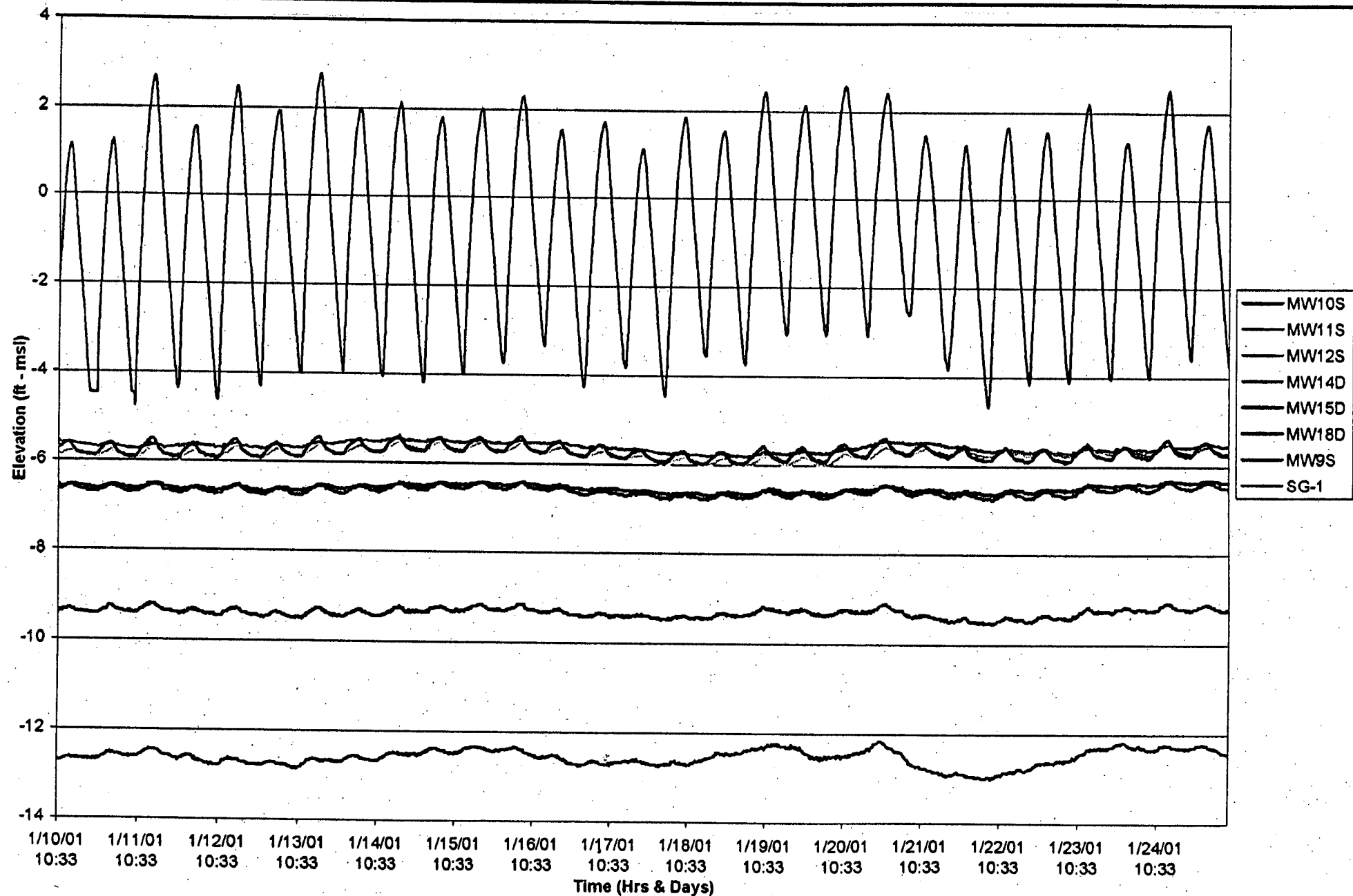
N.J. Department of
Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY, NEW JERSEY
CROSS SECTIONS OF FILL OBSERVED IN TEST PITS
NJDEP CONTRACT No. A-86149

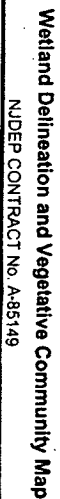
**FULL SIZED FIGURE
BOUND SEPARATELY**

The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, NJ

FIGURE 5-2

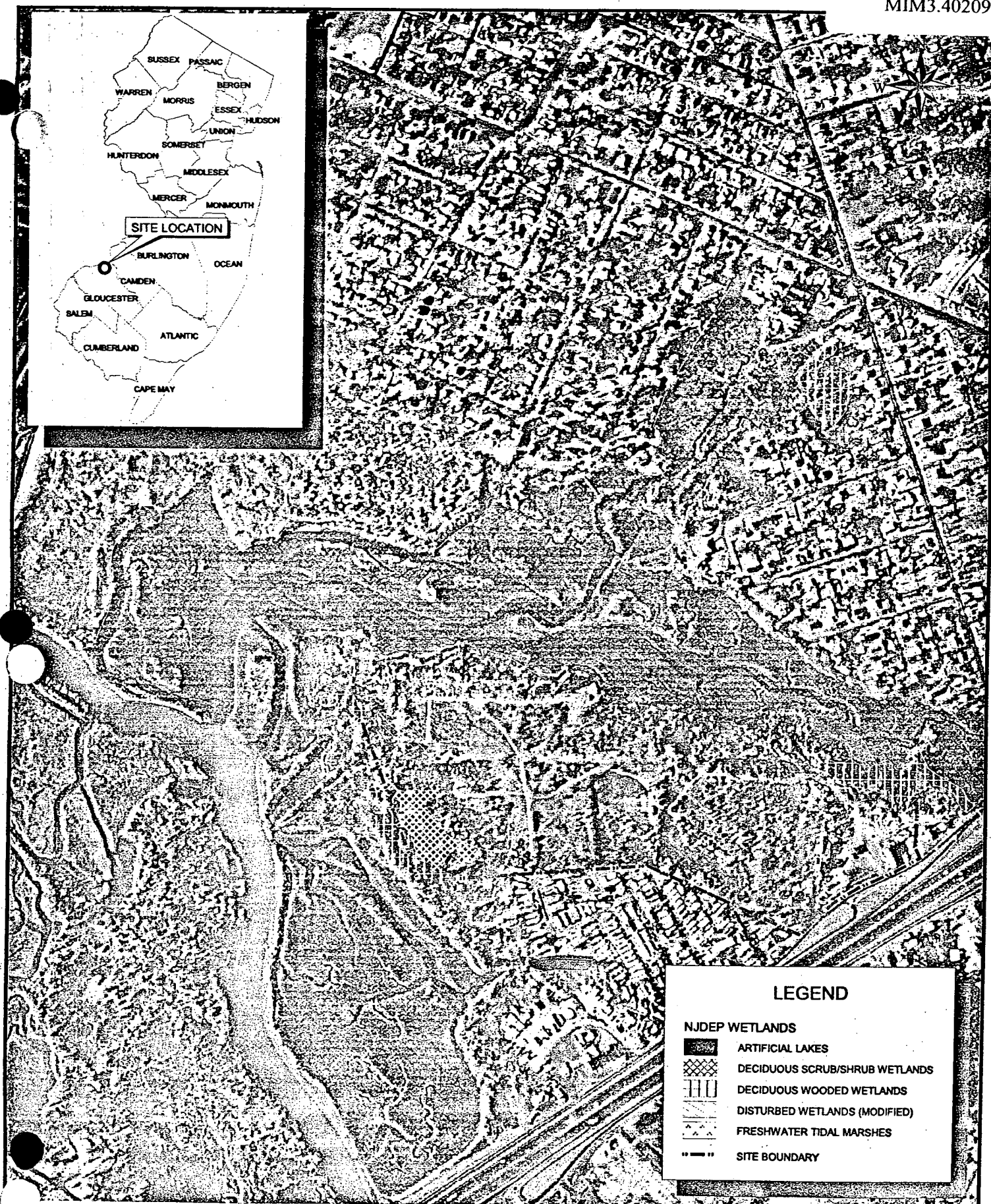


MIM3.40207



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Florham Park, NJ

FIGURE 5-4



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Protection

Matteo Iron and Metals, Gloucester County, New Jersey

NJDEP WETLANDS

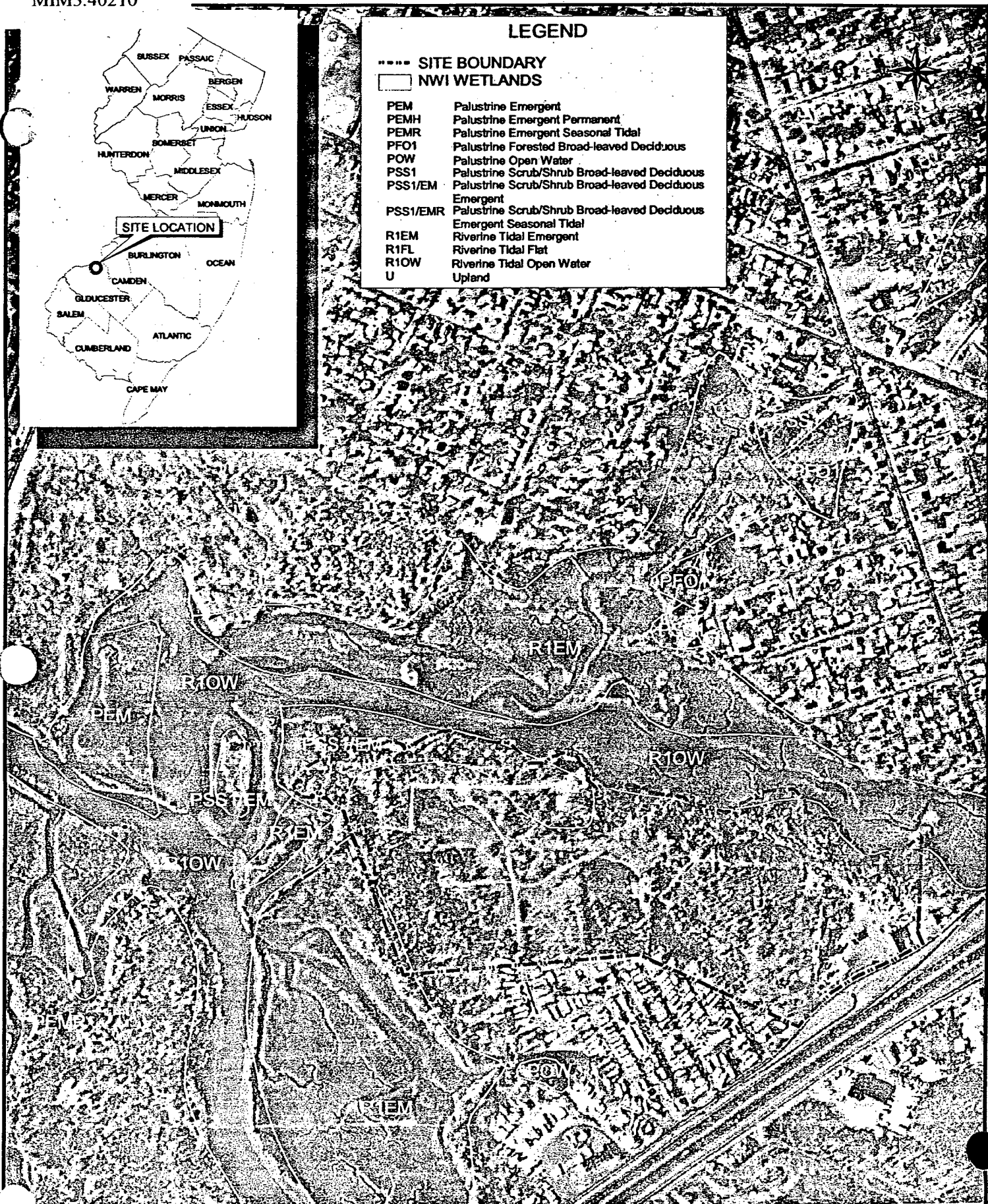
NJDEP CONTRACT No. A-85149

Louis Berger & Assoc.



30 Vreeland Road
Florham Park, NJ

**FIGURE
5-5**



Source: US Fish and Wildlife

Scale: 1" = 600'



N.J. Department
of Environmental
Protection

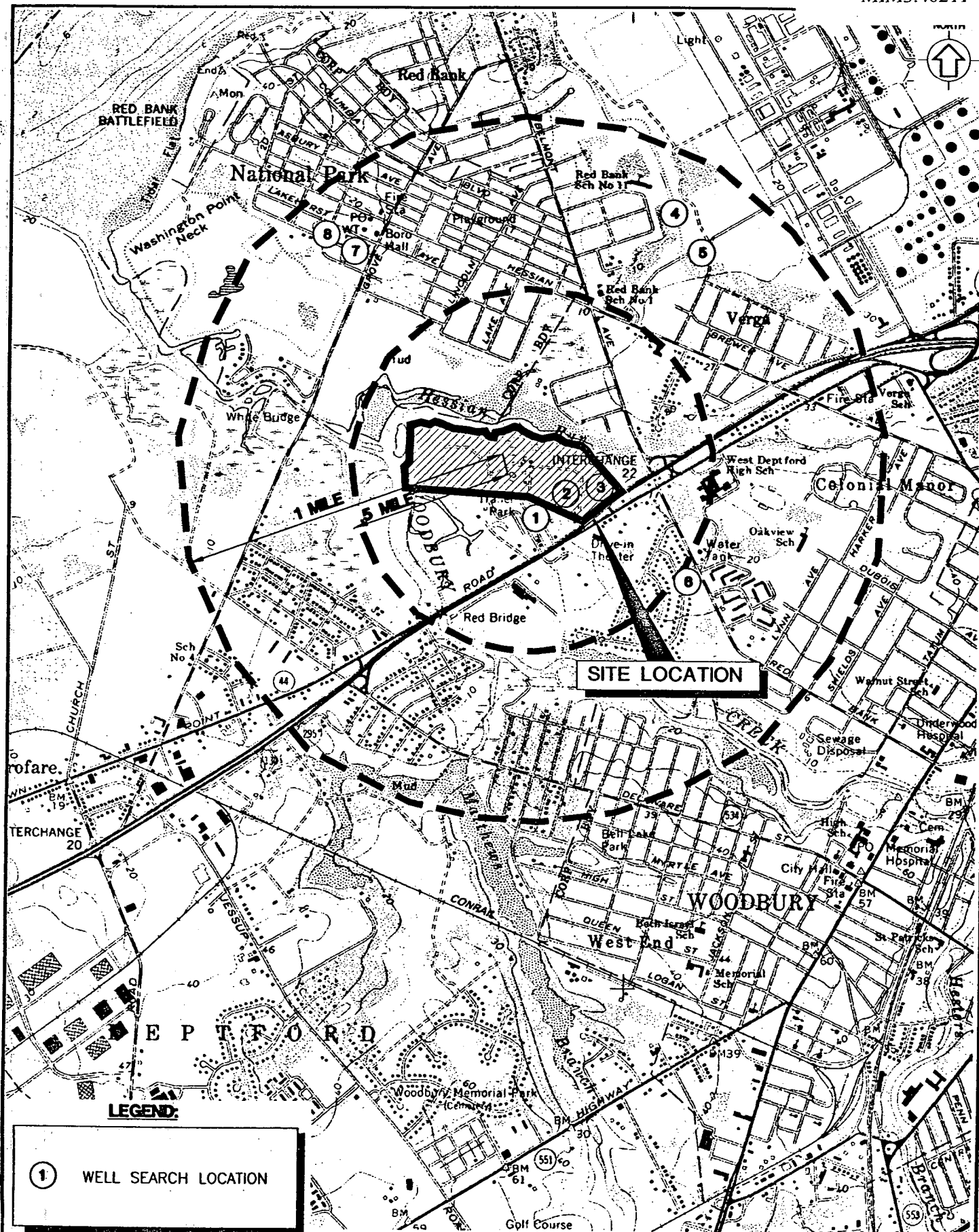
Matteo Iron and Metals, Gloucester County, New Jersey

NWI WETLANDS

NJDEP CONTRACT No. A-85149

Louis Berger & Assoc.
 30 Vreeland Road
 Florham Park, NJ

FIGURE
5-6



Source: USGS Quadrangle, Woodbury, N.J.

Scale: 1" = 2000'



N.J. Department
of Environmental
Protection

MATTEO IRON AND METALS - GLOUCESTER COUNTY,
NEW JERSEY

WELL SEARCH MAP

NJDEP CONTRACT No. A-85149



The Louis Berger Group, Inc.
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Florham Park, NJ

FIGURE 5-7

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FINAL AQUATIC BIOTA STUDY REPORT

Remedial Investigation and Remedial Action Selection

Term Contract Number A-47449

Matteo Iron and Metal
West Deptford, New Jersey

Submitted to:



STATE OF NEW JERSEY
Department of Environmental Protection
401 East State Street,
Trenton, New Jersey

Submitted by:



The Louis Berger Group, Inc.
30 Vreeland Road
Florham Park, New Jersey 07932

December 2004



THE Louis Berger Group, INC.

30 Vreeland Road, Building A, Florham Park, New Jersey 07932-1904
Tel: 973 678 1960 Fax 973 676 3564 www.louisberger.com

December 30, 2004

Mr. Larry Quinn, Project Manager
New Jersey Department of Environmental Protection
Division of Remediation Management and Response
401 East State Street, PO 413
Trenton, NJ 08625

**RE: Submittal: Final Aquatic Biota Study Report
Matteo Iron & Metal Site
RI/RAS Term Contract No. A-47449**

Dear Mr. Quinn,

The Louis Berger Group, Inc. (Berger) is pleased to submit eight (8) copies of the *Final Aquatic Biota Study Report* (ABSR) for the referenced site. All of the Department's comments on the previously submitted Draft ABSR have been addressed, and revisions have been incorporated into this Final ABSR document accordingly. Should you have any questions or comments, please contact Rich Harding at (973) 765-1811.

Sincerely,

The LOUIS BERGER GROUP, INC.

Thomas G. Lewis, P.E., J.D.
Program Manager

cc: R. Harding, M. McCloskey (Berger)

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Appendix H. NJDEP diagnostic consultation report - <i>Fundulus heteroclitus</i>

EXECUTIVE SUMMARY

In order to assess the potential biological impacts of lead and PCB contamination in sediment and soil resulting from previous activities at the Matteo Iron and Metals site (Site), The Louis Berger Group, Inc. (Berger) conducted studies of the aquatic habitats and biotic communities within and adjacent to the Site in the summer of 2003. Specific studies included water and sediment quality investigations, sediment toxicity assessments, fish and benthic macroinvertebrate community assessments, and tissue contaminant sampling on earthworms, fish, shellfish, and wetland plants. The results of the biological tests were used to assess the bioavailability of contaminants to wildlife and humans and will support remedial action decisions.

Ten aquatic sampling stations were established in the study area, four of which were located adjacent to the Site (Site stations 3, 4, 5 & 6) while the remaining six stations intended as reference stations (reference stations 1, 2, 7, 8, 9 & 10), were located upstream and downstream of the Site in Hessian Run and Woodbury Creek. The dissolved oxygen levels and pH of surface water at Site stations in Hessian Run met the state criteria for FW2 waters. Concentrations of total recoverable lead in water at all Site stations were below the acute aquatic life protection standard, but three of the four Site stations (3, 5, and 6) exceeded the chronic aquatic life protection criteria. Sediment sampling revealed that concentrations of lead in sediments at all Site stations were greater than lead concentrations at all reference stations. Sediment lead concentrations exceeded the Lowest Effects Level of 31 ppm (LEL) at all Site stations, and lead concentrations at three of four Site stations (3, 4, and 6) also exceeded the Severe Effects Level of 250 ppm (SEL). While lead concentrations at Station 6 only slightly exceeded the SEL, lead concentrations recorded at stations 3 and 4, respectively, greatly exceeded the SEL. Based on results presented in the recent Remedial Investigation Report (RIR – Berger, 2004), the locations of Stations 3 and 4 coincide with those of the heaviest concentrations of lead bearing battery casings previously deposited along the Hessian Run shoreline. Concentrations of Aroclor 1254 and Aroclor 1260 detected at all four Site stations exceeded the LEL, but did not exceed the SEL. Concentrations of these two PCB congeners at Site station 4 were approximately ten times higher than concentrations detected at all other stations. Additionally, Site station 4 contained another PCB congener, Aroclor 1242, that was not detected at any other station in the study area.

Sediment toxicity at the ten aquatic sampling stations was investigated through acute exposure experiments using amphipods and larval midges as test organisms, with mortality and growth as measures of toxicity. In the amphipod testing, sediment from Site station 4 resulted in 100% mortality of test organisms, while Site Station 6 had significantly less test organism survival than the control (known environmental quality) sediment. Survival and growth at the other two Site stations (3 and 5) were not significantly different than survival in the control sediment. In the midge testing, sediment from Site station 4 again resulted in 100% mortality of test organisms, while the other three Site stations had significantly lower test organism survival than the control sediment. In both the amphipod and midge testing, several of the reference sites also had significantly lower survival than the control sediment.

Sediment toxicity was also investigated through a chronic exposure experiment lasting 65 days that used midges as test organisms, with the emergence of adult flies as the measure of toxicity. Significantly less emergence occurred at three of the four Site stations than the reference stations. Site station 3 also had a significantly greater number of days before first emergence than the reference stations.

The finfish community assessment compared species richness, diversity, and trophic composition at Site stations to reference stations. Only four species were caught at the Site stations, while twelve species were caught at the reference stations. Mean fish diversity at the four Site stations was considerably lower than at the six reference stations upstream and downstream in Hessian Run and in Woodbury Creek. The fish communities at the Site stations consisted almost entirely of omnivores, whereas fish communities at

the reference stations, while also primarily composed of omnivores, had a greater percentage of water-column feeders and top carnivores. In addition, three species not encountered in a 1977 fish survey of the study area (Hastings and Good, 1977) were caught during this study.

The benthic macroinvertebrate community assessment compared species richness, diversity, trophic composition, and pollution tolerance at Site stations to reference stations. Five taxa were collected at the Site stations, while nine taxa were collected at the reference stations. Mean taxa diversity of the Site stations was slightly lower than that of the reference stations. The benthic macroinvertebrate communities at Site stations and reference stations consisted almost entirely of deposit feeders, with few filter feeders or carnivores. Benthic taxa at the reference stations were primarily pollution-tolerant, but some moderately tolerant and sensitive taxa were present, while the Site stations consisted entirely of pollution-tolerant organisms.

Similar concentrations of lead were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations. PCBs were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations at similar concentrations. Concentrations of lead detected in the wetland plants spatterdock and wild rice at Site stations were considerably higher than those of the Woodbury Creek reference stations. Concentrations of two PCB congeners detected in these plant species at the Site stations were also considerably higher than at the reference stations. In earthworm tissue, lead concentrations at Site stations were over ten times greater than at the reference station. Concentrations of the two PCB congeners detected in earthworms at Site stations were eight times higher than at the reference station.

Twelve finfish species were caught in the study area. Aquatic invertebrate species observed in the study area include the nine benthic macroinvertebrates collected during the community assessment, as well as crayfish. The painted turtle, mud turtle, and snapping turtle were also observed in the study area. Dabbling waterfowl observed in the study area included ducks and Canada geese. Piscivorous birds observed in the study area included the Great Egret, Osprey, Common Tern, and Cormorant. This diversity of species represents a variety of pathways through which wildlife and humans can become exposed to lead and PCBs present at the Site.

1.0 INTRODUCTION

The Louis Berger Group, Inc. (Berger) has been contracted by the New Jersey Department of Environmental Protection (NJDEP) to perform site specific Remedial Investigations (RI) and Remedial Action Evaluations (RAS) at multiple sites throughout the state. As part of this contract, Berger conducted an Aquatic Biota Study (ABS) of the Matteo Iron and Metals site (Site) located in West Deptford, New Jersey (Figure 1).

In August and September 2003, Berger conducted studies of the aquatic habitats and biotic communities within and adjacent to the Site in order to assess the potential biological impacts of known on-site contamination. The contaminants of concern, as identified in the Remedial Investigation Report (May 2001), are lead (Pb) and PCBs. Based on a meeting with NJDEP representatives on March 14, 2001, and a Memorandum provided by the NJDEP dated November 9, 2001, these studies consisted of the following components:

- Sediment toxicity testing
- Water quality testing
- Assessment of resident benthic macroinvertebrate and fish communities, and
- Fish, plant, and benthic macroinvertebrate tissue analysis.

Results of the above biological tests may be used to support the remedial decisions beyond source removal and removal of severely contaminated sediments. If residual sediment contamination is found not to be bioavailable and risk to the aquatic biota is not indicated, further remediation of sediments may not be warranted; if bioavailability and risk are indicated, the decision for remedial action could be supported and determination of risk-based remedial goals will be facilitated by the results of the study.

1.1 Study Area Description

The Site is situated at the confluence of Woodbury Creek and Hessian Run, which experience diurnal tides. Tidal fluctuations range from approximately 5.4 feet at neap tides to approximately 6 feet at spring tides. Tidal currents are strong in the vicinity of Woodbury Creek and Hessian Run, however, there is no data reported on tidal current velocities. At low tide, Woodbury Creek is approximately 10 feet deep, whereas Hessian Run is reduced to a narrow stream less than a foot deep. Both Woodbury Creek and Hessian Run are classified as FW-2NT/SE2 waterways in which there may be a fresh water/salt water interface, however, salinity measurements taken during the Remedial Investigation averaged 0.01 parts per thousand, indicating a strictly freshwater habitat.

Figure 1 presents the location of sampling stations within the study area. Berger, in consultation with NJDEP, established seven sampling stations in Hessian Run and three stations in Woodbury Creek for sediment and water sampling, and biological community assessments. All ten stations are tidally influenced. Stations 3, 4, 5, and 6 (Site stations) in Hessian Run are adjacent to the Site upland areas where previous sampling revealed high soil concentrations of lead. In addition, three upland tissue sampling stations (4E, 4.5E, and 5E) were established on-Site, and one upland tissue sampling station was established off-Site (8E).

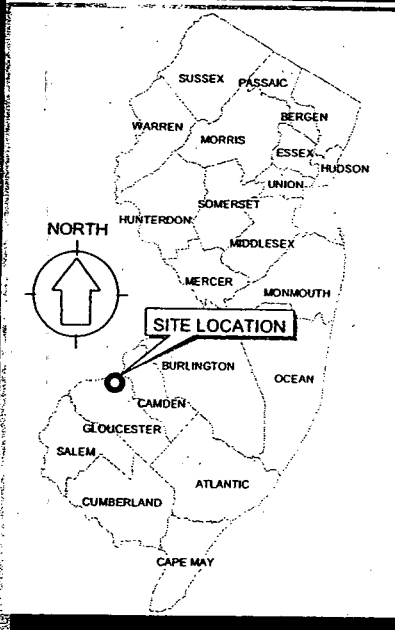
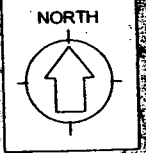
1.2 Sampling Overview

Table 1 presents a summary of parameters investigated at each station. Since several different types of samples were taken at each station for this study, a station was comprised of a transect from the high tide line to mid-channel. Specific sampling locations along transects for each sample type are described in

each respective section below. The geographic positions of each station were collected using a Trimble XRS Global Positioning System (GPS).

Sampling and investigation activities were performed in accordance with the *New Jersey Technical Requirements For Site Remediation*, (NJDEP, 1997), the *New Jersey Field Sampling Procedures Manual* (NJDEP, 1992); *Guidance for Sediment Quality Evaluations* (NJDEP, 1998), and where applicable, other relevant or appropriate United States Environmental Protection Agency (USEPA) regulations and guidance for conducting investigations at uncontrolled hazardous contamination sites.

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N.J. Department of
Environmental Protection

The Louis Berger Group, Inc
30 Vreeland Road
Florham Park, NJ

FIGURE 1

Table 1. Aquatic Biota Study sampling summary.

Station	Fish and Benthic Community Assessment	Sediment Chemistry and Toxicity	Water Quality	Tissue Contaminant Analysis			
				Benthic Invertebrate	Fish	Plant	Earthworm
1*	X	X	X				
2*	X	X	X				
3	X	X	X	X	X		
4	X	X	X	X	X	X	
5	X	X	X	X	X	X	
6	X	X	X			X	
7*	X	X	X				
8*	X	X	X	X	X	X	
9*	X	X	X	X	X	X	
10*	X	X	X	X	X	X	
4E							X
4.5E							X
5E							X
8E*							X

* Intended as reference stations

2.0 WATER AND SEDIMENT QUALITY

2.1 Water Quality

2.1.1 Methods

Water quality samples and in-situ measurements were collected at all 10 stations on August 18 and 19 at high tide within the approximate quarter channel nearest the site. Surface water samples were collected using Kemmerer samplers, and were analyzed for lead, total hardness, and pH. In-situ parameters including temperature, salinity, conductivity, and dissolved oxygen were collected at each station using a YSI 610DM/6820 Environmental Monitoring System (EMS) data logger. Detailed field notes including time of day and tidal condition were recorded.

2.1.2 Results

Table 2 presents lead concentration, total hardness and pH of water samples in the study area. Sample IDs ending in "D" indicate filtered water samples in which the lead concentrations shown are for dissolved lead. Table 3 presents the in-situ water quality data for the study area.



Figure 2. Water quality sampling in Woodbury Creek.

Table 2. Lead concentration, total hardness and pH of water samples in the study area.

Station	Sample ID	pH (Std. Units)	Total Hardness (ppm)	Lead (ppb)	Acute Lead Criterion* (ppb)	Chronic Lead Criterion* (ppb)
1	SW1	7.2	228	1.3 U	156.4	6.1
2	SW2	7.2	176	5.6	118.8	4.6
	SW2D	NA	NA	2.8U	NA	NA
3	SW3	7.3	160	8.9	107.3	4.2
	SW3D	NA	NA	2.8U	NA	NA
4	SW4	7.2	228	4.0	156.4	6.1
	SW4D	NA	NA	2.8U	NA	NA
5	SW5	7.3	100	5.9	64.6	2.5
	SW5D	NA	NA	2.8U	NA	NA
6	SW6	7.3	132	19.5	87.3	3.4
	SW6D	NA	NA	2.8U	NA	NA
7	SW7	7.2	136	3.4	90.1	3.5
	SW7D	NA	NA	2.8U	NA	NA
8	SW8	7.2	116	3.2	75.9	3.0
	SW8D	NA	NA	2.8U	NA	NA
9	SW9	7.3	108	2.8U	70.2	2.7
	SW9D	NA	NA	2.8U	NA	NA
9	SWDUP	7.3	112	2.8U	73.0	2.8
	SWDUPD	NA	NA	2.8U	NA	NA
10	SW10	7.2	76	5.0	47.8	1.9
	SW10D	NA	NA	2.8U	NA	NA

ppm = parts per million (milligrams/liter); ppb = parts per billion (micrograms/liter)

U = not detected above the sample quantitation limit (SQL)

NA = Not analyzed

*Corrected for total hardness

Bolded values indicate positive detections*Italicized values indicate exceedances of acute or chronic criteria*

Table 3. In-situ water quality data for the study area.

Station	Temperature (°C)	Salinity (ppt)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)
1	27.7	0.11	0.254	5.78
2	27.1	0.11	0.237	5.90
3	26.9	0.11	0.233	6.03
4	27.7	0.11	0.247	5.64
5	26.9	0.11	0.236	6.01
6	26.7	0.11	0.238	6.11
7	25.5	0.10	0.223	4.27
8	25.9	0.10	0.225	4.63
9	25.0	0.10	0.221	3.20
10	25.3	0.10	0.220	4.28

The surface water at all ten stations fell within the FW2 pH criteria of 6.5 to 8.5. Dissolved lead was not detected in any of the filtered samples, but lead (total recoverable) was detected in unfiltered samples from most stations. Lead concentrations were corrected for total hardness and acute and chronic aquatic life protection criteria were calculated for each sample. No station exceeded the acute life protection standard, but Stations 2, 3, 5, 6, 8, and 10 exceeded the chronic aquatic life protection criteria. Dissolved oxygen levels at all stations met the minimum NJDEP concentrations for FW2 waters of 4.0 mg/L, except Station 9 which is located off-Site.

2.2 Sediment Quality

2.2.1 Methods

Berger collected surface sediment samples (0 – 6" below ground surface) from the seven stations within the mudflats and various wetland habitats of Hessian Run and the three stations in Woodbury Creek for the range of lead and PCB concentrations that would remain outside of the remedial footprint. Sediment samples were taken from the mid-tide level at each station at low tide.

2.2.2 Results

Sediment chemistry and contaminant concentrations appear in Table 4.



Figure 3. Sediment collection in Hessian Run.

Table 4. Sediment chemistry and contaminant concentrations.

Sediment				Contaminants (ppm)							
Station	Sample ID	pH (Std. Units)	Total Organic Carbon (ppm)	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
1	SED1	6.4	101,200	217	0.05U	0.05U	0.05U	0.05U	0.05U	0.15J	0.15
2	SED2	6.6	55,800	175	0.04U	0.04U	0.04U	0.04U	0.04U	0.2	0.14
3	SED3	6.8	77,000	19,600	0.11U	0.11U	0.11U	0.11U	0.11U	0.39	0.23
4	SED4	6.6	151,700	2,200	1.40U	1.40U	1.40U	7J	1.40U	10	18
5	SED5	6.6	70,600	248	0.10U	0.10U	0.10U	0.10U	0.10U	1.2	0.44
6	SED6	6.4	155,800	349	0.083U	0.083U	0.083U	0.083U	0.083U	0.3	0.11
7	SED7	6.0	31,400	168	0.071U	0.071U	0.071U	0.071U	0.19J	0.66J	0.38
8	SED8	5.2	18,300	70	0.032U	0.032U	0.032U	0.032U	0.032U	0.032U	0.032U
9	SED9	6.9	25,200	96.1	0.052U	0.052U	0.052U	0.052U	0.077	0.16J	0.089J
9	SEDDUP	6.6	40,800	107	0.044U	0.044U	0.044U	0.044U	0.094J	0.18J	0.12J
10	SED10	6.2	29,700	88	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U
Lowest Effects Levels* (LEL), in ppm		NA	NA	31	0.007	NA	NA	NA	0.030	0.060	0.005
Severe Effects Levels* (SEL), in ppm		NA	NA	250	53	NA	NA	NA	150	34	24

U = not detected above the sample quantitation limit (SQL)

J = estimated concentration

Bolded values indicate positive detections* LEL and SEL values from NJDEP's *Guidance For Sediment Quality Evaluations* (1998)

Sediment lead concentrations at the reference stations (1, 2, 7, 8, 9, and 10) ranged from 70 to 217 ppm while concentrations at the Site stations (3, 4, 5 & 6) ranged from 248 to 19,600 ppm (see Figure 4). Aroclor 1242 was detected at Station 4, while Aroclor 1248 was detected at Stations 7 and 9. Concentrations of Aroclor 1254 and 1260 were detected at all stations except 8 and 10 (see Figure 5). At Station 4, concentrations of Aroclor 1242, 1254, and 1260 ranged from 7 to 18 ppm. Concentrations of Aroclor 1242, 1248, 1254, and 1260 detected at all other stations ranged from 0.077 to 1.2 ppm.

Sediment samples were compared to the Lowest Effect Level (LEL) and Severe Effects Level (SEL) Sediment Quality Criteria (SQC) (NJDEP, 1998). The LEL is the concentration at which adverse benthic impacts are found in approximately 10% of studies. NJDEP has determined that the LEL provides the most accurate screening criteria to evaluate sediment contaminants of concern. The LEL values are not cleanup standards, but screening guidelines for use in the Baseline Ecological Evaluation. An exceedance indicates a potential risk to the benthic community. The SEL indicates severe benthic impacts in 95% of studies. The SEL is provided for information purposes; NJDEP does not use the SEL as a screening criteria. These criteria were developed based on benthic community studies of sediment samples and do not directly address biomagnification (food chain toxicity) to birds and mammals. However, values found to be protective of the food chain are generally similar (within an order of magnitude) to LEL values. Lead concentrations exceeded the LEL at all ten stations, and lead concentrations at Stations 3, 4, and 6, also exceeded the SEL. While lead concentrations at Station 6 (349 ppm) only slightly exceeded the 250 ppm SEL, lead concentrations of 19,600 and 2,200 ppm recorded at Stations 3 and 4, respectively, greatly exceeded the 250 ppm SEL. Based on results presented in the recent Remedial Investigation Report (RIR – Berger, 2004), the locations of stations 3 and 4 coincide with those of the heaviest concentrations of lead bearing battery casings previously deposited along the Hessian Run shoreline (see Figure 20 at the end of this report). Concentrations of Aroclor 1248, Aroclor 1254, and Aroclor 1260 detected at stations in the study area all exceeded the LEL, but none exceeded the SEL.

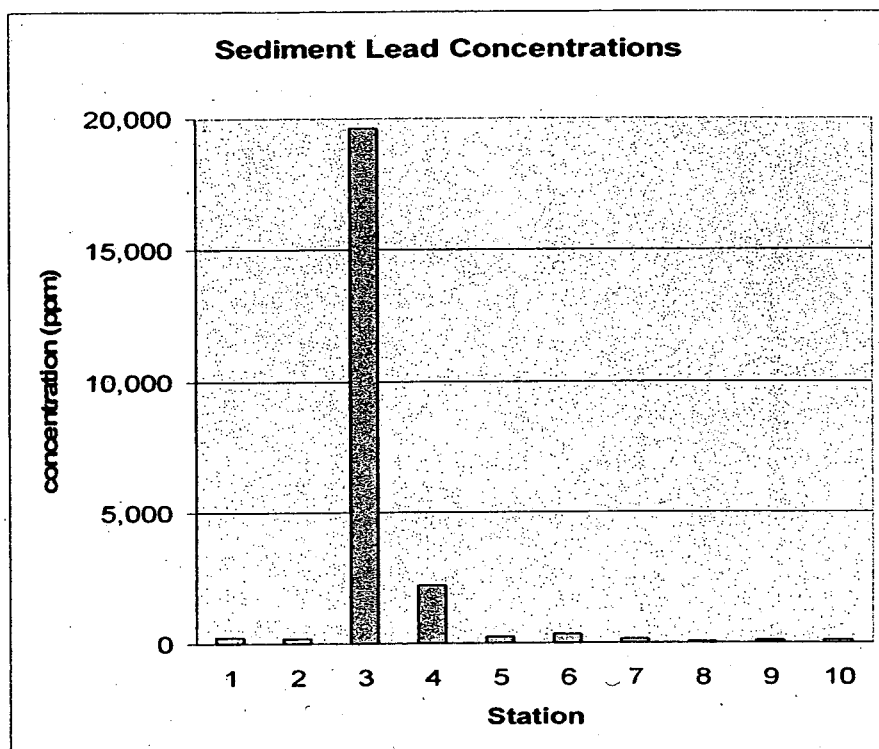


Figure 4. Sediment lead concentrations within study area.

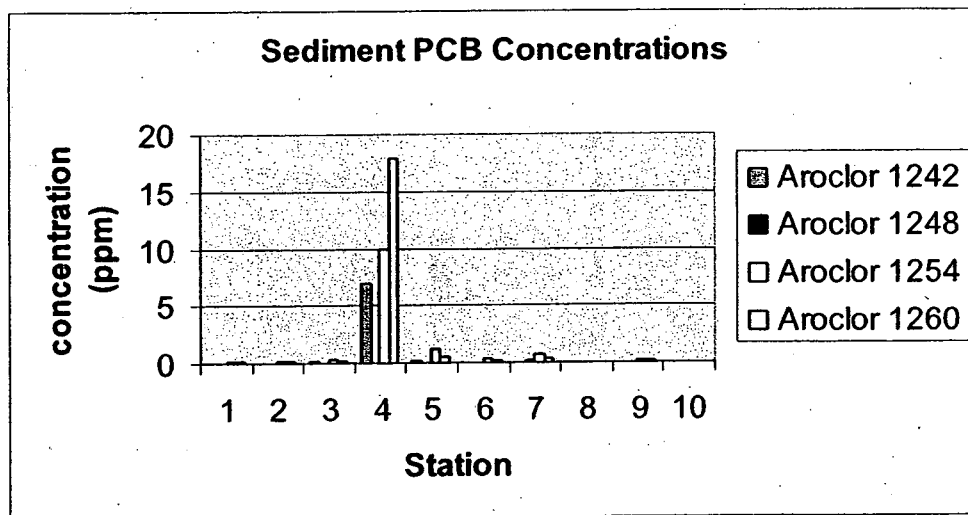


Figure 5. Sediment PCB concentrations within the study area.

3.0 SEDIMENT TOXICITY TESTING

Two gallons of surface sediment (0 – 6" below ground surface) were collected from all ten aquatic stations in the study area for sediment toxicity testing. These sediment samples were taken at the same times and locations as the sediment samples collected for the sediment quality investigation discussed above. Sediment toxicity was investigated by conducting survival and growth testing on two test organisms, the midge *Chironomus tentans*, and the amphipod *Hyaella azteca*, and by conducting growth endpoint (emergence) testing on *C. tentans*.

Data analysis was performed following procedures published by the USEPA (2000) using the Toxstat (1994) data analysis software. All data were transformed by arcsine squareroot and then tested for normality using the Shapiro-Wilk's test or the Chi-Square test and for homogeneity of variance using Bartlett's test, as appropriate. Analysis of variance (ANOVA) followed by Dunnett's *a posteriori* pairwise comparisons or Steel's Many-One Rank test, as appropriate, to evaluate differences between site samples and the control sample.

3.1 Acute Testing- Effects on Survival and Growth

3.1.1 *Hyaella azteca*

The sediment samples from the study area were evaluated for toxicity using a 28-day solid phase exposure with the amphipod *Hyaella azteca*. The sediment exposure series consisted of sediment samples from each of the ten stations in the study area and one of control sediment of known environmental quality (Spruce Run Reservoir). The endpoints used for determination of an impact in the amphipod exposures were mortality, measured as mean survival, and growth, measured as mean dry weight.

For each station, five replicate test chambers were filled with sediment over which test water was poured. The exposure period began by placing 10 randomly selected test organisms into each chamber. Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment, or on the surface of the water. At the end of the 28-day exposure, the sediment was carefully sorted and the surviving test organisms removed for live count verification and weight determination. The full details of this test, including raw data and statistical analysis, are provided in Appendix A.

The data were found to be normally distributed. Data were also tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival and growth of organisms in all samples and the control sample.

Effects on Survival

Results from the analysis, which compared survival in all samples with survival of organisms exposed to the control sample, are presented in Table 5. Samples from Station 4 caused 100% mortality and were eliminated from the analysis. Samples from stations 1, 2, 3, 5 and 8 did not produce mortality statistically different from the control exposure. Amphipods exposed to samples from stations 6, 7, 9 and 10 had significantly lower survival than those exposed to the control treatment, and were not included in the weight comparisons.

Table 5. Percent survival of *H. azteca* by replicate chamber and survival comparison with control sample.

Replicate	Station										
	Control	1	2	3	4*	5	6	7	8	9	10
A	100	100	100	90	0	100	100	70	100	60	90
B	90	90	100	80	0	100	70	40	100	80	60
C	100	90	100	90	0	80	60	70	90	100	80
D	100	100	90	70	0	100	60	60	80	70	60
E	100	100	80	90	0	80	60	40	90	70	50
Mean % Survival	98.0	96.0	94.0	84.0	0	92.0	70.0	56.0	92.0	76.0	68.0
Statistically Different from Control	-	No	No	No	Yes	No	Yes	Yes	No	Yes	Yes

* Sample 4 not included in ANOVA due to 100 % mortality.

Effects on Growth

Results from the analysis which compared mean dry weights for stations 1, 2, 3, 5 and 8 to the control sample are presented in Table 6. Of the five stations that did not exhibit excessive mortality compared to the control sample, stations 1, 2, 3 and 5 did not have mean dry weights significantly different from the control exposure. Only Station 8 was found to have significantly less average dry weight than the control exposure.

Table 6. Mean dry weight (mg) of *H. azteca* by replicate chamber and growth comparison with control sample.

Replicate	Station					
	Control	1	2	3	5	8
A	0.067	0.087	0.073	0.053	0.082	0.039
B	0.077	0.083	0.108	0.074	0.076	0.065
C	0.076	0.106	0.079	0.073	0.091	0.058
D	0.080	0.086	0.072	0.083	0.058	0.071
E	0.079	0.101	0.075	0.081	0.069	0.050
Mean Dry Weight (mg)	0.076	0.093	0.081	0.073	0.075	0.057
Statistically Different from Control	-	No	No	No	No	Yes

3.1.2 *Chironomus tentans*

The sediment samples from the site were also evaluated for toxicity using a 20-day solid phase exposure with the midge *Chironomus tentans*. Like the amphipod tests, the sediment exposure series consisted of sediment samples from each of the ten stations in the study area and one of control sediment of known environmental quality (Spruce Run Reservoir). The endpoints used for determination of an impact in the midge exposures were mortality, measured as mean survival, and growth, measured as mean dry weight.

The test chambers were prepared the same as for the amphipod tests, and the number of replicate samples was the same, but for the midge, 12 individuals were placed into each chamber. Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment, or on the surface of the water. At the end of the 20-day exposure, the sediment was carefully sorted and the surviving test organisms removed for live count verification and weight determination. The full details of this test, including raw data and statistical analysis, appear in Appendix B.

The data were found to be normally distributed. Data were also tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival and growth of organisms in all samples and the control sample.

Effects on Survival

Results from the analysis which compared survival in all samples with survival of organisms exposed to the control sample are presented in Table 7. Once again, samples from Station 4 caused 100% mortality and were eliminated from analysis. Samples from stations 8 and 9 did not produce mortality statistically different from the control exposure. Chironomids exposed to samples from stations 1, 2, 3, 5, 6, 7 and 10 had significantly less survival than those exposed to the control treatment, and were not included in the weight comparisons.

It should be noted that the recommended minimum control survival for chironomids in a 20-day exposure is 70% and this data set produced control survival of 66.7%. This decreased survival in the control may be an artifact of the handling procedures of the newly hatched test organisms during their placement into the test chambers. Since the <24 hour old midge larvae need to be sorted under a dissecting microscope to facilitate their removal from the egg case debris, they are not placed in an interim holding vessel prior to introduction to the test chambers. They are placed directly into the test exposure chambers and this limits the amount of observation time to replace those individuals that may have been adversely affected by handling. As the survival rates for the site samples are markedly lower than the controls, this slight depression in the control survival does not appear to have any adverse impact on the data analysis.

Table 7. Percent survival of *C. tentans* by replicate chamber and survival comparison with control sample.

Replicate	Station										
	Control	1	2	3	4*	5	6	7	8	9	10
A	58.3	50	33.3	0	0	16.7	33.3	16.7	50	8.3	16.7
B	66.7	50	8.3	16.7	0	25	58.3	8.3	75	41.7	16.7
C	58.3	33.3	16.7	0	0	50	0	8.3	58.3	58.3	41.7
D	75	0	66.7	0	0	16.7	50	16.7	100	66.7	8.3
E	75	0	0	8.3	0	16.7	25	33.3	66.7	33.3	33.3
Mean % Survival	66.7	26.7	25	5	0	25	33.3	16.7	70	41.7	23.3
Statistically Different from Control	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes

* Sample 4 not included in ANOVA due to 100 % mortality

Effects on Growth

Results from the analysis which compared mean dry weights for stations 8 and 9 to the control sample are presented in Table 8. Neither of these stations had mean dry weights significantly different from the control exposure.

Table 8. Mean dry weight (mg) of *C. tentans* by replicate chamber and growth comparison with control sample.

Replicate	Station		
	Control	8	9
A	0.789	0.583	1.98
B	0.768	0.550	0.516
C	0.670	0.624	0.579
D	0.450	0.515	0.650
E	0.48	0.695	0.998
Mean Dry Weight (mg)	0.645	0.593	0.945
Statistically Different from Control	-	No	No

3.2 Growth Endpoint - 65-day Exposure

The sediment samples from stations in the study area were also evaluated for toxicity using a 65-day solid phase exposure with the midge *Chironomus tentans*. The endpoints used for determination of an impact in the midge exposures were number of flies which had emerged from the sample sediment.

Like the other tests, the sediment exposure series consisted of sediment samples from each of the ten stations in the project area and one of control sediment from Spruce Run Reservoir. The test chambers were prepared the same as for the 20-day midge tests and the number of replicate samples and test organisms was the same. Observations including the number of organisms dead, swimming, on the surface of the sediment, or on the surface of the water were made and recorded daily to assess organism health. The full details of this test, including raw data and statistical analysis, are provided in Appendix C.

Beginning on Day 20, all test chambers were tightly covered with fine mesh nylon window screen and rubber bands. These covers retained emergent adults in their respective chambers so they could be recorded twice per day. Those individuals that achieved complete emergence were recorded as adult flies to be used in the statistical analysis of this endpoint. Incomplete emergence, those individuals that successfully began to emerge from the pupae, but then became caught, or expired in the process, were recorded as such but not included in the statistical analysis. There were only two individuals that were recorded as incomplete emergents.

On Day 44 of the exposure, the controls reached a total emergence of 53.3% (32 of original 60 test individuals). As this was the final endpoint being assessed, the control treatment could be ended when it achieved >50% emergence of original test organisms. At this time, each test sample was evaluated individually on a daily basis to determine when it should end. Once a site sample had not recorded a new

emergent adult for seven consecutive days after the control treatment ended, that set of five replicate chambers was carefully sorted and all remaining surviving test organisms were recorded.

Effects on First Emergence

The number of days each replicate took to produce the first adult was recorded as a percentage of the total time of the test exposure, 65 days. The data were found to be normally distributed. Data were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival of organisms in all samples and the control sample.

Results from the analysis, which compared the time to first emergence in all samples with that of Stations 8 and 9, the two reference stations, are presented in Table 9. The control values are included for comparative purposes.

Of the sample stations in the study area, only Station 3 was found to have a significantly greater number of days to first emergence. All remaining stations: 4, 5, 6, 7 and 10 did not produce values statistically different from either of the reference stations. Stations 1 and 2 are not included in this analysis as they were originally designed to be used as reference stations, but unacceptable survival precluded their use as references.

Table 9. Average time to 1st emergence of *C. tentans* by sample station, using Stations 8 and 9 for comparison.

Station	Average Days to 1 st Emergence	% of 65 Day Exposure	Significant vs. Station 8 ²	Significant vs. Station 9 ²
Control ¹	29.2	44.9	-	-
8	31.4	48.3	-	N/A
9	30.8	47.4	N/A	-
3	51.2	78.8	Yes	Yes
4	41.6	64.0	No	No
5	40.8	62.8	No	No
6	36.6	56.3	No	No
7	33.6	51.7	No	No
10	31.2	51.1	No	No

1 - Control included for comparison only

2 - Reference stations not compared to each other

Effects on Total Emergence-Comparison with Station 8

Results from the analysis which compared the total emergence in all samples with that of Station 8 are presented in Table 10. Emergence is evaluated at seven day intervals beginning with Day 44, when the control treatment reached >50% emergence. The control value is included for comparative purposes.

Station 8 ended on day 61, with a total emergence of 66.8%. It should be noted here that at Day 44, when the control treatment surpassed the 50% emergence level, Station 8 had produced 48.4% emergent adults. However, the criterion for the ending any sample treatment was no emergent individuals for seven consecutive days, so Station 8 continued until Day 61. Of the stations in the project area compared with reference station 8, Stations 6 and 7 at no time showed a significant difference in total emergence on any

of the days used for evaluation (44, 51, 58 and 65). Of the four remaining stations; 3, 4, 5 and 10, all had significantly less emergence at day 44 compared to Station 8. At 51 days, Station 3 had ended, Stations 4 and 5 were still statistically different compared to Station 8, and Station 10 had produced sufficient numbers of adults to not be significantly different at day 51. At 58 days, Station 5 had ended, and Stations 4 and 10 were different from the reference. At the end of the test, Day 65, Station 4 had ended and Station 10 was again not statistically different from station 8. Stations 3, 4 and 5 have been highlighted in the table below to show that at all points during the exposure period these samples were producing significantly different responses compared to that of the reference (Station 8). The last sample from Station 10, appears to have suffered some deleterious response, however, the statistical analysis at Day 65 did not find the final emergence of 39.4% to be different from the reference sample.

Table 10. Total emergence of *C. tentans* by station using Station 8 for comparison.

Station	Percent Emergence @ 44 days	Significant vs. sta. 8 @ 44 days	Percent Emergence @ 51 days	Significant vs. sta. 8 @ 51 days	Percent Emergence @ 58 days	Significant vs. sta. 8 @ 58 days	Percent Emergence @ 65 days	Significant vs. sta. 8 @ 65 days
Control	53.4	-	-	-	-	-	-	-
8	48.4	-	61.6	-	66.8	-	66.8	-
3	3.2	Yes	Ended	-	-	-	-	-
4	16.4	Yes	19.8	Yes	19.8	Yes	Ended	-
5	16.6	Yes	16.6	Yes	Ended	-	-	-
6	35	No	48.2	No	70	No	76.8	No
7	28.2	No	41.6	No	46.6	No	46.6	No
10	24.8	Yes	34.8	No	34.8	Yes	39.8	No

Effects on Total Emergence-Comparison with Station 9

Results from the analysis which compared the total emergence in all samples with that of Station 9 are presented in Table 11. Emergence is evaluated at seven-day intervals beginning with Day 44, when the control treatment reached >50% emergence. The control value is included for comparative purposes.

Station 9 ended on Day 65, with a total emergence of 71.6%. It should be noted here that at Day 44, when the control treatment surpassed the 50% emergence level, Station 9 had produced 45.2% emergent adults. However, the criterion for the ending any sample treatment was no emergent individuals for seven consecutive days, so Station 9 continued until Day 65. Of the stations in the study area compared with reference Station 9, Stations 6 and 7 at no time showed a significant difference in total emergence on any of the days used for evaluation (44, 51, 58 and 65). Of the four remaining stations; 3, 4, and 5 had significantly less emergence at Day 44 compared to station 9. Station 10 was not significantly different from reference Station 9. At 51 days, Station 3 had ended, Stations 4 and 5 were still statistically different compared to Station 9, and Stations 6, 7 and 10 were not significantly different from Station 9. At 58 days, Station 5 had ended, and Stations 4 and 10 were significantly different from Station 9. At the end of the test, Day 65, Station 4 had ended, Stations 6 and 7 ended with no difference compared to Station 9 and Station 10 remained statistically different from Station 9. Stations 3, 4 and 5 have been highlighted in the table below to show that at all points during the exposure period these samples were producing significantly different responses compared to that of Station 9.

Table 11. Total emergence of *C. tentans* by sample location using Station 9 for comparison.

Station	Percent Emergence @ 44 days	Significant vs. sta. 9 @ 44 days	Percent Emergence @ 51 days	Significant vs. sta. 9 @ 51 days	Percent Emergence @ 58 days	Significant vs. sta. 9 @ 58 days	Percent Emergence @ 65 days	Significant vs. sta. 9 @ 65 days
Control	53.4	-	-	-	-	-	-	-
9	45.2	-	58.4	-	66.8	-	71.6	-
3	3.2	Yes	Ended	-	-	-	-	-
4	16.4	Yes	19.8	Yes	19.8	Yes	Ended	-
5	16.6	Yes	16.6	Yes	Ended	-	-	-
6	35	No	48.2	No	70	No	76.8	No
7	28.2	No	41.6	No	46.6	No	46.6	No
10	24.8	No	34.8	No	34.8	Yes	39.8	Yes

Effects on Total Survival

Results from the analysis which compared the total survival in all samples with that of Stations 8 and 9 are presented in Table 12. The control values are included for comparative purposes. The remaining stations; 1, 2 and 10 were considered as alternate reference stations but unacceptable survival precluded their use as references. The recommended minimum survival for the emergence portion of this test is 65% at the completion of testing. The control treatment as well as Stations 8 and 9 exceeded this level of surviving test organisms.

Of the sample stations in the study area, Station 3 was found to have a significantly lower survival than Stations 8 and 9. Stations 4 and 7 were found to have statistically different survival rates when compared to Station 9.

Table 12. Total survival of *C. tentans* by sample location using Stations 8 and 9 for comparison.

Station	Percent Total Survival	Significant vs. Control	Significant vs. Station 8	Significant vs. Station 9
Control ¹	88.3	-	-	-
1	25.0	Yes	-	-
2	40.0	Yes	-	-
3	50.0	-	Yes	Yes
4	21.7	-	No	Yes
5	81.7	-	No	No
6	81.7	-	No	No
7	46.7	-	No	Yes
8	68.3	No	-	NA
9	80.0	No	NA	-
10	55.0	Yes	No	No

¹ - Control included for comparison only

NA - Stations 8 and 9 were not compared to each other

4.0 FISH AND BENTHIC MACROINVERTEBRATE COMMUNITY ASSESSMENTS

4.1 Fish Community Assessment

4.1.1 Methods

Berger conducted an assessment of the resident fish communities to evaluate the ecological integrity of the aquatic system adjacent to the Site. Berger collected fish samples from each of the seven stations within Hessian Run and three stations within Woodbury Creek (Figure 1). Berger utilized fish collected during this effort to supply tissue samples for the analyses described in Section 5.1. Fish samples were collected using a 30-foot beach seine (0.25-inch mesh) (Figure 6), except at Stations 1, 2, and 3 in Hessian Run where a 10-foot seine (0.25 inch mesh) was used because of the narrow channel width. Three replicate hauls were made within two hours of low tide at each station in the opposite direction of the prevailing tidal current. Each haul attempted to cover 20 meters of the substrate, but in many cases, submerged obstructions such as logs and stumps limited hauls to shorter distances. Fish were identified in the field and counted, and 25 individuals of each species were measured per replicate sample, if available.

4.1.2 Results

Table 13 presents the fish species richness, diversity, and trophic composition at each of the 10 stations sampled during the study. Results of the fish survey were compared with historical studies conducted within the project vicinity (e.g., Hastings and Good, 1977). Raw fish data and statistical summary are provided in Appendices D and E.



Figure 6. Finfish sampling at Station 5 in Hessian Run, looking west.

Table 13. Fish species abundance, richness, diversity, and trophic composition.

Species Name	Common Name	Abundance										Totals	
		Station										Stations 3, 4, 5 and 6	Reference Stations
		1	2	3	4	5	6	7	8	9	10		
<i>Fundulus diaphanus</i>	Banded Killifish	14	3	15	306	67	50	22	370	384	61	438	854
<i>Fundulus heteroclitus</i>	Mummichog	8	6	12	708	224	26	16	2	15	4	970	51
<i>Etheostoma olmstedii</i>	Tessellated darter	1						3	10	1	5		20
<i>Hybognathus regius</i>	Eastern Silvery Minnow	1	1						2	38	42		84
<i>Alosa pseudoharengus</i>	Alewife				2			3	39	4	13	2	59
<i>Lepomis gibbosus</i>	Pumpkinseed		1		7	1		1	2	5	1	8	10
<i>Anguilla rostrata</i>	American Eel								3	2			5
<i>Anchoa spp.</i>	Anchovy								2	1			3
<i>Menidia menidia</i>	Silversides										1		1
<i>Morone americana</i>	White Perch		1					1	44	19	14		79
<i>Morone saxatilis</i>	Striped Bass								4		2		6
<i>Trinectes maculatus</i>	Hogchoker							1	3				4
Total		24	12	27	1023	292	76	47	481	469	143	1418	1176
Species Richness													
(total number of species caught)		4	5	2	4	3	2	7	11	9	9	4	12
Shannon-Weaver Diversity Index													
(mean of station replicates)		0.334	0.275	0.298	0.288	0.260	0.279	0.510	0.390	0.306	0.586	0.287	0.473
Trophic Composition													
% omnivores		96	83	100	99	100	100	81	78	93	76	99	84
% bottom invertebrate feeders		4	0	0	0	0	0	9	3	0	3	0	2
% water column feeders		0	8	0	1	0	0	9	9	2	10	1	6
% top carnivores		0	8	0	0	0	0	2	11	4	11	0	8

Species Richness and Diversity

Overall, twelve species of fish were caught in the study area. Of these, four species are freshwater (*Fundulus diaphanus*, *Etheostoma olmstedii*, *Hybognathus regius*, and *Lepomis gibbosus*), six are estuarine and marine (*Fundulus heteroclitus*, *Anchoa spp.*, *Menidia menidia*, *Morone americana*, *Morone saxatilis*, and *Trinectes maculatus*), and two are diadromous (*Alosa pseudoharengus* and *Anguilla rostrata*). Only four species were caught at stations adjacent to the Site (Stations 3, 4, 5, and 6), while twelve species were caught at the reference stations.

For stations adjacent to the Site (Stations 3, 4, 5, and 6), diversity was particularly low, with the catch consisting almost entirely of *F. diaphanus* and *F. heteroclitus*, with only a few individuals of *A. pseudoharengus* and *L. gibbosus* caught. Mean fish diversity at these four stations, as measured by the Shannon-Weaver Diversity Index, was 0.287, while at the reference stations upstream and downstream in Hessian Run and in Woodbury Creek, the fish diversity index was 0.473. Fish species caught in Woodbury Creek included *Anguilla rostrata*, *Anchoa spp.*, *Menidia menidia*, and *Morone saxatilis*, in addition to the eight species caught in Hessian Run. Fish diversity was relatively low in Hessian Run, compared to Woodbury Creek. *Fundulus diaphanus* and *Fundulus heteroclitus* comprised over 98% (1,477 of 1,501) of fish caught in Hessian Run. Very low numbers of six additional species (24

individuals) were caught in Hessian Run, including *Etheostoma olmstedi*, *Hybognathus regius*, *Alosa pseudoharengus*, *Lepomis gibbosus*, *Morone americana*, and *Trinectes maculatus*.

Trophic Composition

The trophic composition of the fish communities at stations in Hessian Run and Woodbury Creek is depicted in Table 13. Trophic compositions are based on the percentage of individuals which are either omnivores (*Fundulus diaphanus*, *Fundulus heteroclitus*, *Hybognathus regius*, and *Menidia menidia*), bottom invertebrate feeders (*Etheostoma olmstedi* and *Trinectes maculatus*), water column feeders (*Alosa pseudoharengus*, *Lepomis gibbosus* and *Anchoa* spp.), or top carnivores (*Anguilla rostrata*, *Morone americana*, and *Morone saxatilis*). Because of the dominance of *F. diaphanus* and *F. heteroclitus* in the fish communities of the study area, omnivores dominate these communities. The fish communities at Hessian Run stations consisted largely of omnivores (86% to 100%), with few fish in the other trophic levels, particularly Stations 3, 4, 5, and 6 (on-Site) which consisted almost entirely of omnivores (99% to 100%). Omnivores were also dominant at the Woodbury Creek stations (76% to 93% of individuals), but to a lesser degree than in Hessian Run. The greatest proportion of top carnivores in the community was found at stations in Woodbury Creek.

Comparison with Previous Studies

Station 2 and 7 in Hessian Run and Station 9 in Woodbury Creek were also sampled by Hastings and Good (1977) during August, allowing direct comparisons of species richness (Table 14). Unfortunately, no sampling was performed adjacent to the Site in the 1977 study, so no comparisons with the Site across time is possible. In Hessian Run, the same number of species was caught in both studies (8). However, the 1977 study encountered three species, *Anguilla rostrata*, *Notropis hudsonius*, and *Pinephales notalus*, which were not found in 2003. Three species, *Etheostoma olmstedi*, *Alosa pseudoharengus*, and *Trinectes maculatus*, were caught in 2003 but were not encountered in 1977. *A. pseudoharengus* was caught in 2003 in Hessian Run during other sampling months in 1977, but *E. olmstedi* and *T. maculatus* were not caught in either Hessian Run or Woodbury Creek in 1977. Since the 1977 study spanned several months, it is unlikely that these two species occurred there at that time. The present study did not catch *A. rostrata* in Hessian Run during the fish community assessment, but several individuals were subsequently caught within Hessian Run during invertebrate tissue collection efforts.

At Station 9 in Woodbury Creek, the same number of species (9) was caught in both studies, however, the 1977 study reported four species not found in 2003: *Pinephales notalus*, *Pomoxis nigromaculatus*, *Notemigonus crysoleucas*, and *Alosa aestivalis*. Four species, *Etheostoma olmstedi*, *Lepomis gibbosus*, *Anguilla rostrata*, and *Anchoa* spp. were found in 2003 but not in August 1977, however, *L. gibbosus* and *A. rostrata* were caught in Woodbury Creek during other sampling months in 1977. *E. olmstedi* and *Anchoa* spp. were not caught in either Hessian Run or Woodbury Creek in 1977, and since that study spanned several months, it is unlikely that these two species occurred there at that time.

Looking beyond Station 9, several other species not observed in Woodbury Creek in August 1977 were caught in 2003, including *Menidia menidia* and *Morone saxatilis*. Again, the 1977 study spanned several months, so it is unlikely that these species would have been missed had they been present.

Table 14. Comparisons of fish communities at stations sampled during both the present study and the 1977 study.

Species	Hessian Run (Stations 2 and 7)		Woodbury Creek (Station 9)	
	1977	2003	1977	2003
<i>Fundulus diaphanus</i>	x	x	x	x
<i>Fundulus heteroclitus</i>	x	x	x	x
<i>Etheostoma olmstedii</i>		x		x
<i>Hybognathus regius</i>	x*	x	x	x
<i>Alosa pseudoharengus</i>		x	x	x
<i>Lepomis gibbosus</i>	x	x		x
<i>Anguilla rostrata</i>	x			x
<i>Anchoa</i> spp.				x
<i>Menidia menidia</i>				
<i>Morone americana</i>	x	x	x	x
<i>Morone saxatilis</i>				
<i>Trinectes maculatus</i>		x		
<i>Notropis hudsonius</i>	x			
<i>Pinephales notalus</i>	x		x	
<i>Pomoxis nigromaculatus</i>			x	
<i>Notemigonus crysoleucas</i>			x	
<i>Alosa aestivalis</i>			x	
Total species	8	8	9	9

X = present

*Identified as *Hybognathus nuchalis* by Hastings and Good

Occurrence and Length Frequency Distributions of *Fundulus* spp.

Fundulus diaphanus and *Fundulus heteroclitus* constituted approximately 89% of the total number of fish caught during the study. These two species were nearly equally abundant overall, but *F. heteroclitus* in Hessian Run outnumbered *F. diaphanus* by 2 to 1 (1,000 to 477); whereas in Woodbury Creek, *F. diaphanus* outnumbered *F. heteroclitus* by nearly 40 to 1 (815 to 21). *F. heteroclitus* is an extremely hardy species and is able to tolerate the more stressful environmental conditions encountered in Hessian Run at low tide when the water may be less than a foot deep. *F. diaphanus* was relatively more abundant in Woodbury Creek near low tide, where environmental conditions are much less variable than in Hessian Run.

The length frequency distributions of *F. diaphanus* and *F. heteroclitus* in the study area appear in Figures 7 and 8. Lengths from the three replicates at each station were pooled. Members of the 2002 and 2003 year classes of both species were found in Hessian Run and Woodbury Creek. These year classes for *F. diaphanus* consist of distinct peaks at 35 mm and 68 mm, while for *F. heteroclitus*, the peaks are less distinct but appear at 38 mm and 59 mm, with a possible third year class at 75 mm.

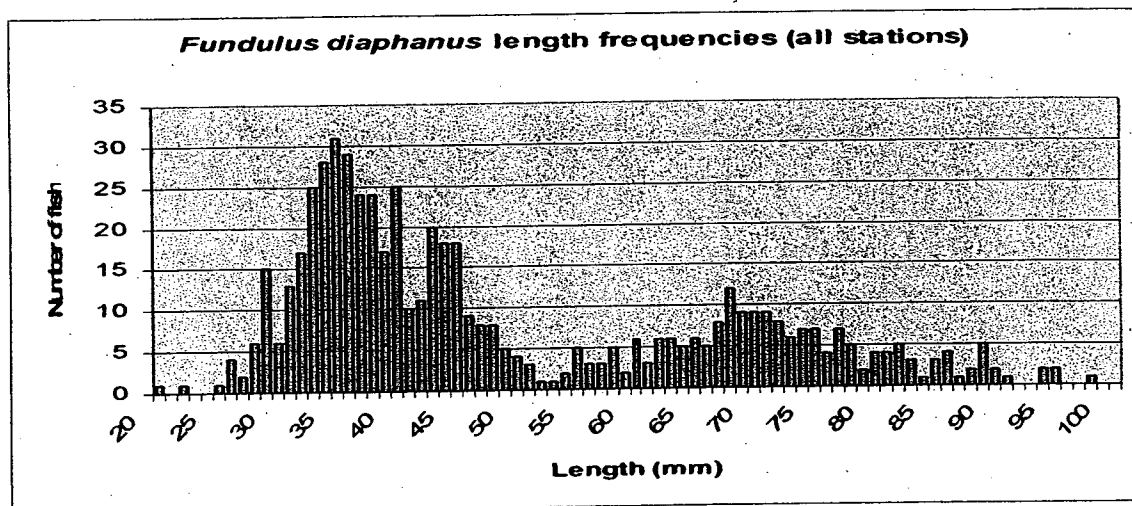


Figure 7. *Fundulus diaphanus* length frequencies in the study area.

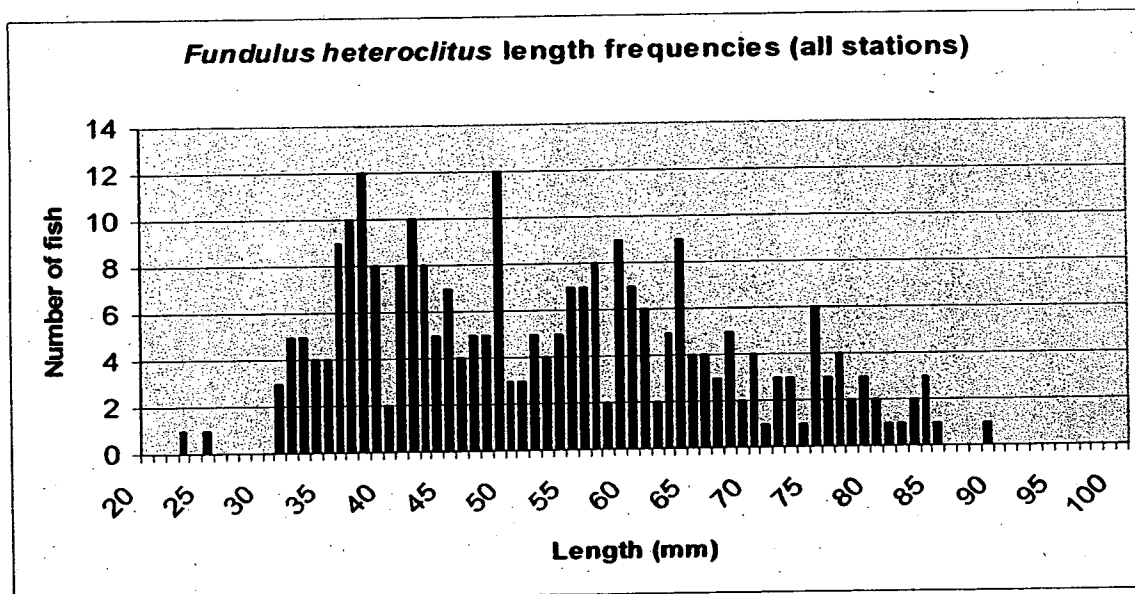


Figure 8. *Fundulus heteroclitus* length frequencies in the study area.

4.2 Benthic Macroinvertebrate Community Assessment

Berger conducted an assessment of the resident benthic macroinvertebrate communities to evaluate the ecological integrity of the aquatic system adjacent to the Site. Berger collected benthic macroinvertebrate samples from each of the seven stations within Hessian Run and the three stations within Woodbury Creek (Figure 1). The substrate composition throughout the study area is predominately silt and mud with underlying clay. Benthic cores were obtained by advancing a 100 mm by 100 mm hand-held square core 100 mm into the substrate at the water's edge at low tide. Three replicate samples were taken at each station, several feet apart from each other. Each sample was washed through a 0.5 mm sieve bucket and fixed in 95% ethanol. Samples were sorted in the field (Figure 9) and identified to the lowest practical taxon in the laboratory. Species abundance, number of species, and diversity of each replicate were recorded. Benthic macroinvertebrate species abundance, richness, diversity, trophic composition, and pollution tolerance for all stations is provided in Table 15. Raw benthic macroinvertebrate data and statistical summary appear in Appendices F and G.



Figure 9. Sorting benthic samples in the field.

Table 15. Benthic macroinvertebrate species abundance, richness, diversity, trophic composition, and pollution tolerance.

Species Abundance		Station										Stations 3, 4, 5 and 6	Reference Stations
Order/Class	Species/Taxa	1	2	3	4	5	6	7	8	9	10		
Oligochaeta	Oligochaete A	8	159	172	15	126	68	38	19	48	18	381	290
	Oligochaete B					19	3	4	4			22	8
Insecta	Odonata-Gomphidae	1											1
	Diptera-Chironomidae	41	70	38	13	46	85	15	19	2	19	182	166
Crustacea	Isopoda-Anthuridae		1								4		5
	Amphipod-Gammaridae	7							1				8
Bivalvia	Asian clam	50	21	12	1	11	2	1	5	4	6	26	87
	Unionidae	4	2										6
Hirudinea	Leech	2	3	3		1						4	5
Total		113	256	225	29	203	158	58	48	54	47	615	576
Species Richness													
(total species/taxa)		7	6	4	3	5	4	4	5	3	4	5	9
Shannon-Weaver Diversity Index													
(mean of station replicates)		0.526	0.414	0.372	0.284	0.420	0.325	0.332	0.526	0.162	0.462	0.409	0.522
Trophic Composition													
% deposit feeders		49.6	89.8	93.3	96.6	94.1	98.7	98.3	89.6	92.6	87.2	95.1	82.8
% filter feeders		47.8	9.0	5.3	3.4	5.4	1.3	1.7	10.4	7.4	12.8	4.2	16.1
% carnivores		2.7	1.2	1.3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.7	1.0
Pollution Tolerance													
% tolerant		89.4	98.8	100	100	100	100	100	97.9	100	91.5	100	96.5
% moderately tolerant		9.7	1.2	0	0	0	0	0	2.1	0	8.5	0	3.3
% sensitive		0.9	0	0	0	0	0	0	0	0	0	0	0.2

Species Richness and Diversity

Overall, nine benthic macroinvertebrate taxa were collected from the sediments of the 10 stations in the study area. All macroinvertebrates collected during this study are typically found in freshwater, with the exception of the isopod, which generally occurs in brackish or marine habitats. Five taxa were collected at stations adjacent to the site (Stations 3, 4, 5, and 6), while nine taxa were collected at the reference stations.

Macroinvertebrate diversity in both Hessian Run and Woodbury Creek was fairly low, with Oligochaetes, Chironomids, and the Asian clam comprising over 97% (1,162 of 1,191) of the individuals collected. Low numbers of five additional taxa (29 individuals in all) were collected: Gomphidae, Anthuridae, Gammaridae, Unionidae and Hirudinea. Macroinvertebrate diversity at stations in Hessian Run, as measured by the Shannon-Weaver Diversity Index, was generally in the range of that of Woodbury Creek stations. However, overall diversity of the stations adjacent to the Site (Stations 3, 4, 5, and 6) was lower than that of the reference stations in Hessian Run and Woodbury Creek. The mean macroinvertebrate diversity index at Stations 3, 4, 5, and 6 was 0.409, while the mean diversity of the reference sites upstream and downstream in Hessian Run and in Woodbury Creek was slightly higher at 0.522.

Trophic Composition

The trophic composition of the macroinvertebrate communities at stations in Hessian Run and Woodbury Creek are provided in Table 15. Trophic compositions are based on the percentage of individuals which are either deposit feeders (Oligochaetes, Chironomids, Anthurids, and Gammarids), filter feeders (Asian clam and Unionidae), or carnivores (Gomphidae and Hirudinea). Because of the dominance of Oligochaetes and Chironomids in the benthic macroinvertebrate communities of the study area, deposit feeders dominate these communities. The macroinvertebrate communities at Stations 3, 4, 5, and 6 in Hessian Run adjacent to the Site consisted almost entirely of deposit feeders (95%), with few filter feeders (4%) or carnivores (less than 1%). Macroinvertebrate communities at the reference stations in Hessian Run and Woodbury Creek also consisted primarily of deposit feeders (83%) and contained few carnivores (1%), but had considerably more filter feeders (16%) than Stations 3, 4, 5, and 6. As presented in Table 15, most of these filter feeders were collected at Stations 1 and 2, where the sediments were sandier than most other stations sampled in the study area, likely accounting for the higher numbers of juvenile clams.

Pollution Tolerance

The Rapid Bioassessment Protocol procedure used by NJDEP's Bureau of Freshwater and Biological Monitoring is based on the USEPA's Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers (EPA 841-B-99-002 Nov. 1999). This procedure involves the use of a net to collect insects, mollusks, and crustaceans in stream bottoms. The data analysis scheme calculates an impairment score based on five metrics, two of which are measures of the abundance of EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera, commonly known as mayflies, stoneflies, and caddisflies) which are pollution sensitive. Because of the tidal nature of the study area and the predominance of silty sediments in the streambeds, macroinvertebrates in the study area are generally infauna which cannot be collected by net. Additionally, no EPT taxa were found in the macroinvertebrate communities of the study area. Therefore, the USEPA protocol is not appropriate to characterize the health of tidal streams with soft bottoms as those encountered during this study.

No single document was found which rated the pollution tolerance of the various macroinvertebrate taxa observed in the study area, however, several reports were used to develop estimations of relative tolerance by each taxa. These sources include Gosner (1977), USDA (1999), and USEPA (1990). Pollution tolerance, as shown in Table 15, is based on the assumption that Oligochaetes, the Asian clam, and Hirudinea are tolerant; Unionidae, Anthuridae and Gammaridae are moderately tolerant; and Gomphidae are sensitive to pollution. The macroinvertebrate communities at Stations 3, 4, 5, and 6 were entirely composed of tolerant organisms. The communities of reference stations upstream and downstream in Hessian Run and in Woodbury Creek were composed primarily of tolerant taxa (96.5%), but also contained some moderately tolerant taxa (3.3%) and a single sensitive individual.

5.0 TISSUE ANALYSIS

In order to assess the potential for food chain bioavailability and bioaccumulation of lead and PCBs from the project site, Berger conducted tissue analysis on specimens representing various trophic levels within the study area. Four components were analyzed: fish tissue (two trophic levels), wetland vegetation tissue (two species), benthic invertebrate tissue from wetland soils, and invertebrate tissue from upland soils. Approximately 20 - 50 grams of tissue of each species were collected per replicate from each station for tissue analysis.

5.1 Fish Tissue

Berger conducted tissue analysis on *F. diaphanus* (whole fish) for ecological risk assessment. Three replicate samples were collected at each of three on-site stations (Stations 3, 4, and 5) and three replicates were collected from each of three stations located within Woodbury Creek (Stations 8, 9, and 10). The pumpkinseed, *Lepomis gibbosus*, a fish consumed by humans, provided tissue for assessment of risk to human health, although due to the small size of the individuals caught, it was not possible to sample edible portions of this species, so whole fish were analyzed. Additionally, very few *L. gibbosus* were caught in Hessian Run (only one tissue sample was collected at Station 4) and at Station 9 in Woodbury Creek. Tables 16 and 17 present the concentrations of lead and several PCB congeners found in the tissue of *F. diaphanus* and *L. gibbosus* in the study area. No disease or anomalies were observed among fish submitted for tissue collection, but it was noted that some larger *F. diaphanus* and *F. heteroclitus* individuals had red lesions around the mouths or gills. At the request of NJDEP, a single sample comprised of *F. heteroclitus* individuals affected by lesions was submitted for tissue sampling (see Table 18). Additionally, a sample of live *F. heteroclitus* bearing lesions was submitted to NJDEP fish pathologists for their examination; the results are provided in Appendix H.

Table 16. Concentrations of lead and PCB congeners in tissue of *Fundulus diaphanus*.

<i>Fundulus diaphanus</i>		Contaminants (ppm)							
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
3	3F1	1.5	0.015U	0.015U	0.015U	0.015U	0.036	0.19	0.067
	3F2	1.6	0.015U	0.015U	0.015U	0.015U	0.032	0.17	0.061
	3F3	1.6	0.025U	0.025U	0.025U	0.025U	0.043J	0.25	0.087
4	4F1F	0.78	0.05U	0.05U	0.05U	0.05U	0.1J	0.38J	0.13
	4F2F	0.78	0.025U	0.025U	0.025U	0.025U	0.068J	0.3J	0.16
	4F3F	0.7	0.025U	0.025U	0.025U	0.025U	0.056	0.24J	0.11J
5	5F1F	0.99	0.05U	0.05U	0.05U	0.05U	0.074	0.44J	0.16
	5F2F	1.2	0.05U	0.05U	0.05U	0.05U	0.069	0.39	0.16
	5F3F	0.82	0.025U	0.025U	0.025U	0.025U	0.09	0.26	0.075
8	8F1	0.7	0.025U	0.025U	0.025U	0.025U	0.053	0.18J	0.091
	8F2	0.71	0.015U	0.015U	0.015U	0.015U	0.038	0.12J	0.078J
	8F3	0.69	0.025U	0.025U	0.025U	0.025U	0.053	0.19J	0.11J
9	9F1	0.85	0.025U	0.025U	0.025U	0.025U	0.062	0.26	0.097
	9F2	0.86	0.025U	0.025U	0.025U	0.025U	0.057J	0.17J	0.1J
	9F3	1.4	0.015U	0.015U	0.015U	0.015U	0.048	0.14J	0.078
10	10F1	0.37	0.05U	0.05U	0.05U	0.05U	0.075	0.3	0.18
	10F2	0.46	0.025U	0.025U	0.025U	0.025U	0.071	0.24J	0.14
	10F3	0.39	0.025U	0.025U	0.025U	0.025U	0.061	0.24J	0.14

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Table 17. Concentrations of lead and PCB congeners in tissue of *Lepomis gibbosus*.

<i>Lepomis gibbosus</i>		Contaminants (ppm)							
Location	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
Hessian Run (Station 4)	4F1L	0.6	0.025U	0.025U	0.025U	0.025U	0.081	0.24J	0.12
	4F2L	0.52	0.015U	0.015U	0.015U	0.015U	0.068	0.14J	0.069
	4F3L	0.47	0.05U	0.05U	0.05U	0.05U	0.1	0.27J	0.29J
Woodbury Creek (Station 9)	9F1L	0.17J	0.01U	0.01U	0.01U	0.01U	0.035	0.12	0.072
	9F2L	0.28	0.025U	0.025U	0.025U	0.025U	0.11	0.28	0.092
	9F3L	0.61	0.025U	0.025U	0.025U	0.025U	0.082	0.2	0.076

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Table 18. Concentrations of lead and PCB congeners in tissue of *Fundulus heteroclitus* with lesions around the mouth or gills.

<i>Fundulus heteroclitus</i>		Contaminants (ppm)							
Location	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
Hessian Run	HRF	0.56	0.025U	0.025U	0.025U	0.025U	0.079	0.18	0.068

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections.

As depicted in Figure 10, concentrations of lead detected in *Fundulus diaphanus* from stations in Hessian Run adjacent to the Site and from Woodbury Creek reference stations were similar, with mean concentrations ranging from approximately 0.5 to 1.5 ppm. Concentrations of the three PCBs detected in *Fundulus diaphanus* from stations in Hessian Run adjacent to the Site and from Woodbury Creek reference stations were also similar, with mean concentrations ranging from approximately 0.05 to 0.35 ppm.

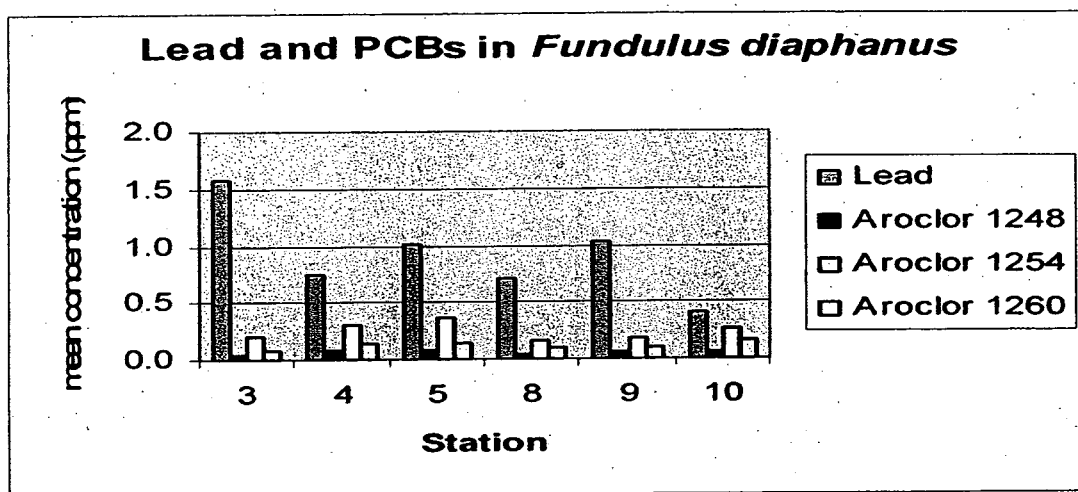
**Figure 10. Mean lead and PCB concentrations detected in *Fundulus diaphanus*.**

Figure 11 depicts the mean lead and PCB concentrations detected in *Fundulus heteroclitus* and *Lepomis gibbosus* in the study area. Concentrations of both lead and PCBs detected in *Fundulus heteroclitus* in Hessian Run adjacent to the Site were less than 0.6 ppm. These values are in the range of concentrations of these contaminants found in *Fundulus diaphanus* in both Hessian Run and Woodbury Creek. Concentrations of lead and PCBs detected in *Lepomis gibbosus* in Hessian Run adjacent to the Site were also low, and were similar to concentrations found in this species in Woodbury Creek, with mean concentrations ranging from approximately 0.1 to 0.5 ppm.

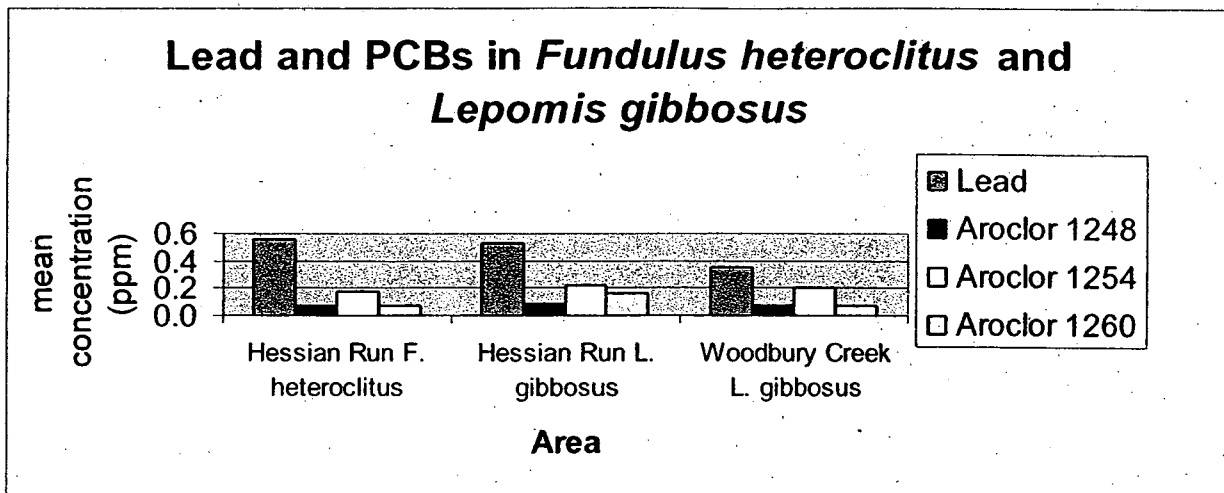


Figure 11. Mean lead and PCB concentrations detected in *Fundulus heteroclitus* and *Lepomis gibbosus* in the study area.

While lead and three PCB congeners were detected in fish species of different trophic levels at both the reference stations and stations in Hessian Run adjacent to the Site, the concentrations of these contaminants were less than 1 ppm. Concentrations of these contaminants in fish tissue at reference stations and stations adjacent to the Site were similar. Because Hessian Run drains almost completely at low tide, most fish caught there are probably transients and thus are not exposed to potential contaminants for significant periods.

Growth of juvenile brook trout (the same trophic level as *Lepomis gibbosus*) was not affected by whole-body tissue concentrations of lead ranging from 2.5 to 5.1 ppm (Jarvinen and Ankley 1999). These reported no-effect values are several times higher than those observed in *L. gibbosus* in the study area (less than 1 ppm), so no effects on growth are expected as a result of lead contamination from the site. No published data were available to compare tissue lead concentrations of fish from the same trophic level as *Fundulus diaphanus*, but the observed concentrations were also lower than the no-effect level reported for brook trout.

Most PCB contamination studies in fish have focused on the effects of Aroclor 1254. Survival and growth of juvenile rainbow trout was not affected by whole-body tissue concentrations of Aroclor 1254 of 81 ppm (Jarvinen and Ankley 1999). This reported no-effect value for Aroclor 1254 is much higher than those observed in *L. gibbosus* in the study area (less than 1 ppm). Aroclor 1248 and 1260 were detected in *L. gibbosus* in the study area in similarly low concentrations, so no effects on growth are expected as a result of contamination from these PCBs from the site.

Survival and growth of adult fathead minnows (the same trophic level as *F. diaphanus*) was not affected by whole-body tissue concentrations of Aroclor 1254 ranging from 741 to 1253 ppm (Jarvinen and Ankley 1999). These reported no-effect values for Aroclor 1254 are much higher than those observed in *F. diaphanus* in the study area (less than 1 ppm). Aroclor 1248 and 1260 were detected in *F. diaphanus* in the study area in similarly low concentrations, so no effects on survival or growth are expected as a result of contamination from these PCBs from the site.

The USEPA has established guidance for assessing chemical contaminant data for use in fish advisories (USEPA 2000). This guidance does not include screening for lead. The PCB screening in the guidance is for total PCBs. This study investigated fish tissue contamination of seven PCB congeners, but total PCB concentrations in fish tissue were not measured. Additionally, the screening is based on edible portions,

which were not obtained during the study due to the small size of the fish caught. Because of this, our data are not directly comparable with the EPA screening guidance.

The mean combined concentrations of Aroclor 1248, 1254, and 1260 in whole-body tissue of *L. gibbosus* in Hessian Run was 0.459 ppm, and in Woodbury Creek it was 0.356 ppm. USEPA's fish consumption guidance for noncancer health endpoints recommends that fish tissue with total PCB concentrations exceeding 0.38 ppm should not be consumed (fish meals per month=none (less than 0.5)). For cancer health endpoints, the guidance recommends that there should be no consumption of fish tissue with total PCB concentrations exceeding 0.094 ppm (fish meals per month=none (less than 0.5)). Whole-body tissue of *L. gibbosus* in both Hessian Run and Woodbury Creek exceeded both USEPA's noncancer and cancer health endpoints for any fish consumption.

5.2 Benthic Macroinvertebrate Tissue

Berger conducted benthic macroinvertebrate tissue analysis on the Asian clam (*Corbicula fluminea*) for ecological risk assessment. Three replicate samples were collected at each of three on-site stations (Stations 3, 4, and 5) and three replicates were collected from each of three stations located within Woodbury Creek (Stations 8, 9, and 10). Asian clams were collected from the substrate with the use of a rake and sieve with $\frac{1}{4}$ inch mesh (Figure 12). As each clam contained approximately 0.08 g of tissue, 250 clams were collected per sample in order to collect the minimum target sample of 20 g. Table 19 presents the concentrations of lead and several PCB congeners found in the tissue of the Asian clam in the study area.

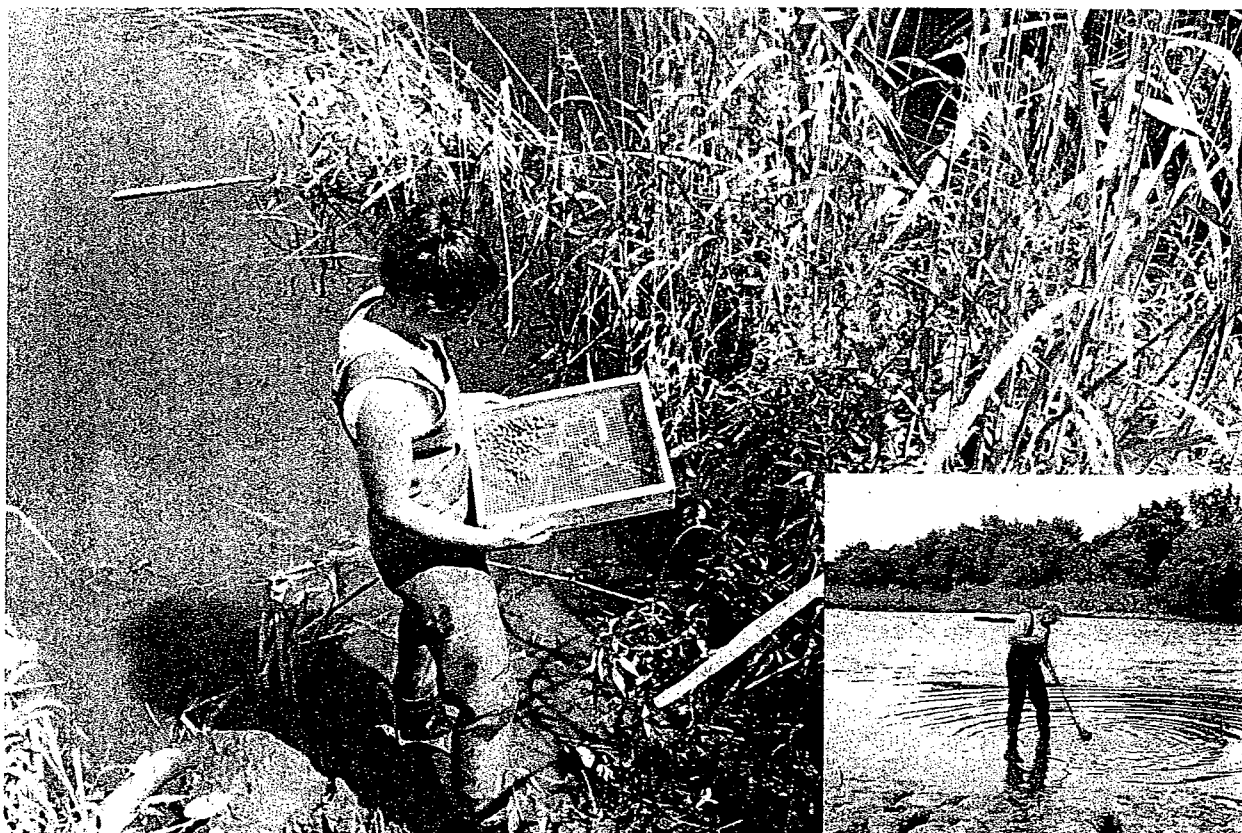


Figure 12. Collecting Asian clams for tissue contaminant analysis.

As depicted in Figure 13, concentrations of lead detected in the Asian clam at stations in Hessian Run adjacent to the Site and from Woodbury Creek reference stations were similar, with mean concentrations ranging from approximately 0.4 to 0.9 ppm. Concentrations of the three PCB congeners detected in the Asian clam were also similar at stations in Hessian Run and Woodbury Creek, with mean concentrations of less than 0.3 ppm. While the Asian clam is truly a resident of stations adjacent to the Site, it feeds on plankton transported by the tide which are not exposed to potential on-Site contaminants present in the sediment, and as such, the clam's tissues have low concentrations of these contaminants.

Table 19. Concentrations of lead and PCB congeners in tissue of the Asian clam.

Asian Clam		Contaminant (ppm)							
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
3	3B1	0.79	0.025U	0.025U	0.025U	0.025U	0.066J	0.19	0.032J
	3B2	0.54	0.025U	0.025U	0.025U	0.025U	0.07	0.19	0.025U
	3B3	0.44	0.025U	0.025U	0.025U	0.025U	0.078	0.22	0.026
4	4B1	0.78	0.025U	0.025U	0.025U	0.025U	0.084	0.23	0.029
	4B2	0.73	0.025U	0.025U	0.025U	0.025U	0.1	0.26	0.033
	4B3	0.91	0.025U	0.025U	0.025U	0.025U	0.1	0.26	0.036
5	5B1	0.52	0.025U	0.025U	0.025U	0.025U	0.072	0.2	0.026
	5B2	0.53	0.025U	0.025U	0.025U	0.025U	0.062	0.18	0.0250U
	5B3	0.59	0.025U	0.025U	0.025U	0.025U	0.066	0.18	0.0250U
8	8B1	1.3	0.025U	0.025U	0.025U	0.025U	0.041J	0.12	0.025U
	8B2	0.57	0.015U	0.015U	0.015U	0.015U	0.034J	0.093	0.021
	8B3	0.92	0.015U	0.015U	0.015U	0.015U	0.035J	0.1	0.021
9	9B1	0.38	0.01U	0.01U	0.01U	0.01U	0.029	0.082	0.013
	9B2	0.46	0.015U	0.015U	0.015U	0.015U	0.047	0.14	0.022
	9B3	0.5	0.015U	0.015U	0.015U	0.015U	0.048	0.14J	0.024
10	10B1	0.86	0.025U	0.025U	0.025U	0.025U	0.046J	0.13	0.032
	10B2	0.56	0.025U	0.025U	0.025U	0.025U	0.047J	0.13	0.027J
	10B3	1	0.015U	0.015U	0.015U	0.015U	0.03J	0.091	0.025J

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

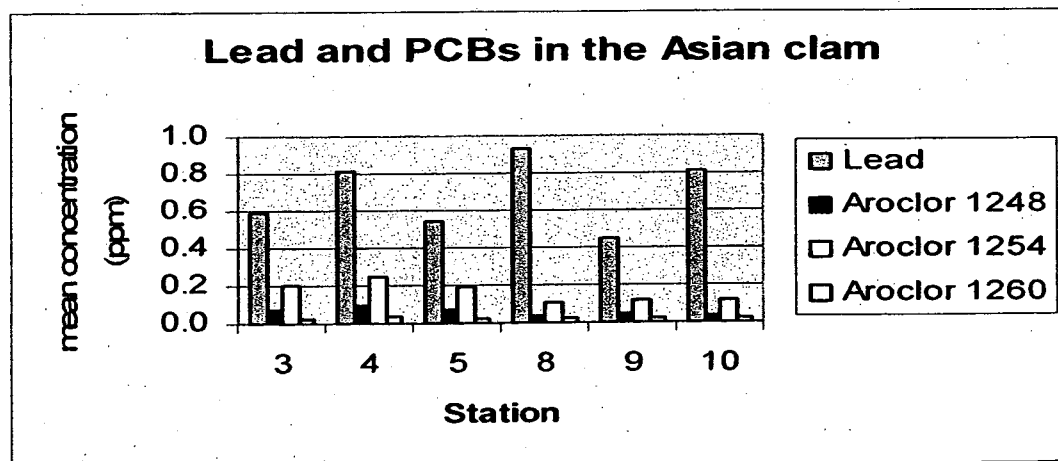


Figure 13. Mean lead and PCB concentrations detected in the Asian clam in the study area.

5.3 Upland Invertebrate Tissue

Berger collected three replicate earthworm (*Lumbricus* spp.) samples from three stations within upland soil on the project site and one off-site reference station for ecological risk assessment. The sample

station locations are depicted on Figure 1. Earthworm samples were collected using shovels. Upon collection, earthworms were rinsed with distilled water to remove associated soil particles. In the laboratory, the whole earthworms were homogenized and sampled for the contaminants of concern. Earthworms were not dissected and no depuration of earthworm guts was undertaken.



Figure 14. Taking position of earthworm collection site with GPS.

Table 20 shows the concentrations of lead and several PCB congeners found in the tissue of earthworms in the study area. No disease or anomalies were observed among earthworms.

Table 20. Concentrations of lead and PCB congeners in earthworm tissue.

Earthworm		Contaminant (ppm)							
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
4E	4E1	441	0.50U	0.50U	0.50U	0.50U	0.50U	2.9	3.1
	4E2	400	0.50U	0.50U	0.50U	0.50U	0.50U	2.4	2.4J
	4E3	511	0.50U	0.50U	0.50U	0.50U	0.50U	2.1	3.2J
4.5E	4.5E1	339	0.50U	0.50U	0.50U	0.50U	0.50U	3.5	5.6
	4.5E2	269	0.50U	0.50U	0.50U	0.50U	0.50U	2.5	4
	4.5E3	414	0.50U	0.50U	0.50U	0.50U	0.50U	2.5	3.2
5E	5E1	1,090	0.075U	0.075U	0.075U	0.075U	0.075U	0.62	0.37
	5E2	1,150	0.10U	0.10U	0.10U	0.10U	0.10U	0.69	0.37
	5E3	1,100	0.10U	0.10U	0.10U	0.10U	0.10U	0.73	0.36
8E	8E1	4.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.005U
	8E2	25.1	0.025U	0.025U	0.025U	0.025U	0.025U	0.12J	0.025U
	8E3	5.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.014	0.005U

U = not detected above the Sample Quantitation Limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Figure 15 depicts the mean lead concentrations detected in earthworm tissue within the study area. Mean concentrations of lead detected in earthworm tissue at on-Site stations ranged from approximately 340 to 1,100 ppm, while the mean concentration at the reference station was only 12 ppm. Figure 16 depicts the mean PCB concentrations in earthworm tissue within the study area. Mean concentrations of the two PCB congeners detected in earthworms at on-Site stations ranged from approximately 0.4 to 4 ppm, while only one of these congeners was detected in earthworms at the reference station, and at a much lower mean concentration of about 0.05 ppm. Lead was detected in earthworms at the on-Site stations in mean concentrations 20 times greater than that of the reference station. PCBs were detected in earthworms at the on-Site stations in mean concentrations eight times greater than that of the reference station.

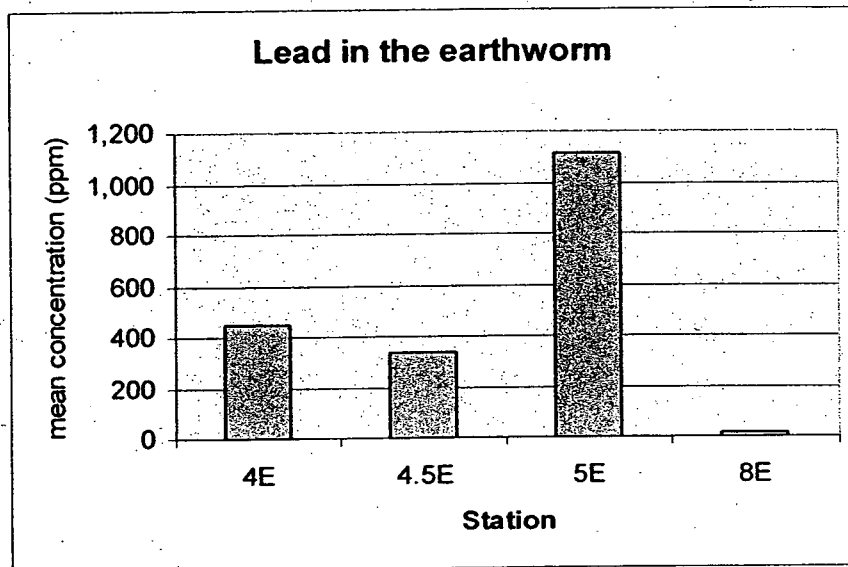


Figure 15. Mean lead concentrations detected in earthworm tissue in the study area.

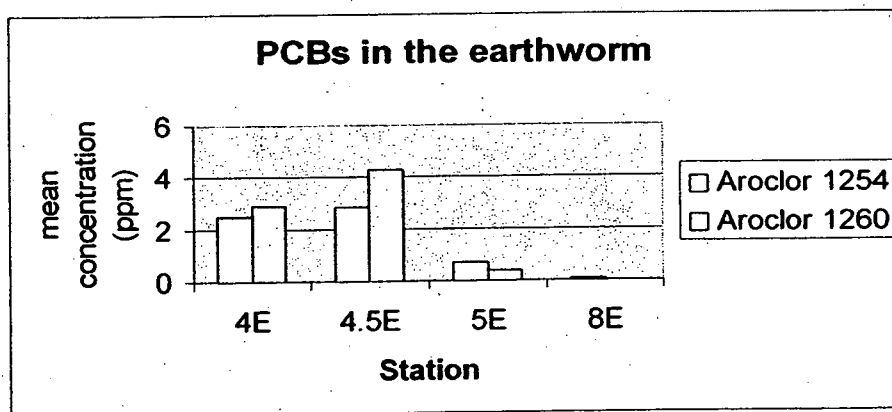


Figure 16. Mean PCB concentrations detected in earthworm tissue in the study area.

Soil samples were not collected for analysis at the time of this study's earthworm sampling event, however, eight soil samples were collected and analyzed for lead from test pits during the previous RI investigations in the vicinity of the earthworm sampling Stations 4E, 4.5E and 5E. Those eight soil samples were collected at depths ranging from 0-3 feet bgs, and exhibited elevated lead concentrations ranging from a minimum of 821ppm to a maximum of 31,300, and the mean lead concentration was 11,600ppm. All of these lead contaminated soil samples were collected in areas containing observed

buried and surface battery casings and other mixed waste materials, as were the earthworm tissue samples exhibiting elevated lead and PCB concentrations at Stations 4E, 4.5E and 5E. Although no previous soil samples had been collected near earthworm Station 8E (which exhibited much lower lead and PCB concentrations), no battery casings or other mixed waste were observed at this location. Since lead and PCB concentrations in earthworm tissue were reported high in areas containing battery casings or other mixed waste, and much lower where waste was not observed, there appears to be a direct correlation between lead in earthworms and the presence or absence of site related waste materials. Although the previous RI soil samples collected near the earthworm tissue stations were not analyzed for PCBs, the same correlation can be drawn between the observed presence or absence of waste and elevated PCBs concentrations in tissue.

5.4 Wetland Plant Tissue

Berger conducted tissue analyses on the wetland plants wild rice (*Zizania aquatica*) and spatterdock (*Nuphar luteum*), which were common in Hessian Run and along the shorelines of Woodbury Creek. Three replicate samples of each species were collected at each of three on-site stations in Hessian Run (Stations 4, 5 and 6) and at one reference station within Woodbury Creek (Station 8). For both spatterdock and wild rice, the tissue collection consisted of above-ground portions of vegetation. Careful attention during the field collection process ensured that only vegetation which was free of sediment was collected. Spatterdock samples were composed of stems and leaves, while wild rice samples consisted of stems, leaves, and seedheads.

Tables 21 and 22 show the concentrations of lead and several PCB congeners found in the tissue of wild rice and spatterdock in the study area.

Table 21. Concentrations of lead and PCB congeners in tissue of the wetland plant spatterdock.

Spatterdock		Contaminant (ppm)							
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
4	4PN1	9.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.015J	0.0083
	4PN2	4.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.0095J	0.005U
	4PN3	5.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.0053
5	5PN1	8.4	0.005U	0.005U	0.005U	0.005U	0.005U	0.015J	0.008
	5PN2	6.7	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.0076
	5PN3	7.6	0.005U	0.005U	0.005U	0.005U	0.005U	0.013J	0.0058
6	6PN1	4.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.0088J	0.005U
	6PN2	5.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.01J	0.0051
	6PN3	3.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.0094J	0.005U
8	8PN1	1.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PN2	1.4	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PN3	1.6	0.005U	0.005U	0.005U	0.005U	0.027	0.005U	0.005U

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Table 22. Concentrations of lead and PCB congeners in tissue of the wetland plant wild rice.

Wild Rice		Contaminant (ppm)							
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
4	4PZ1	2.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	4PZ2	6.1	0.005U	0.005U	0.005U	0.005U	0.005U	0.007J	0.005U
	4PZ3	5.6	0.005U	0.005U	0.005U	0.005U	0.005U	0.0052J	0.005U
5	5PZ1	1.3	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	5PZ2	3.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.0062	0.005U
	5PZ3	1.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
6	6PZ1	8.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.0073J
	6PZ2	6	0.005U	0.005U	0.005U	0.005U	0.005U	0.0084J	0.005U
	6PZ3	7.1	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.0074J
8	8PZ1	0.33	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PZ2	0.36	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PZ3	0.23J	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Both lead and PCBs were detected in the two wetland plant species at stations adjacent to the Site. Figure 17 depicts mean lead concentrations detected in wetland plants in the study area. Mean concentrations of lead detected in the wetland plants spatterdock and wild rice at stations in Hessian Run adjacent to the Site ranged from approximately 2 to 7 ppm, while the mean concentrations in these plants at the Woodbury Creek reference station were less than 2 ppm. Figures 18 and 19 depict mean PCB concentrations in spatterdock and wild rice in the study area. Mean concentrations of the two PCB congeners detected in these two wetland plants at stations in Hessian Run adjacent to the Site ranged from approximately 0.005 to 0.015 ppm, while neither of these two congeners was detected in the tissue of these plant species at the Woodbury Creek reference station.

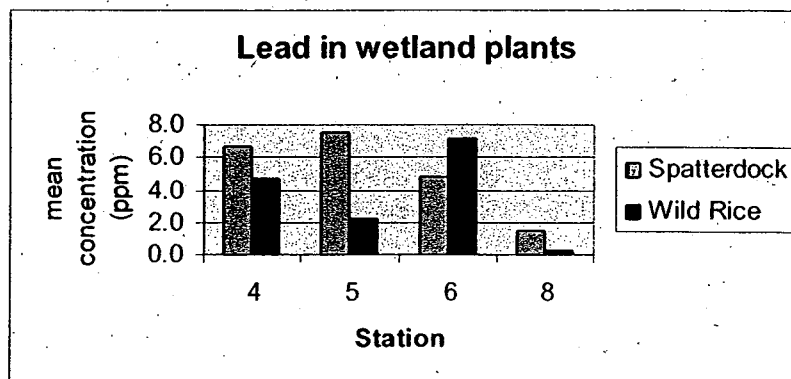


Figure 17. Mean lead concentrations detected in wetland plants in the study area.

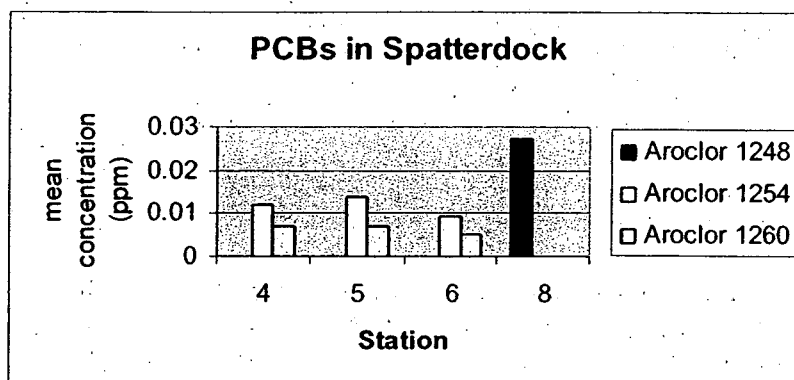


Figure 18. Mean PCB concentrations detected in spatterdock in the study area.

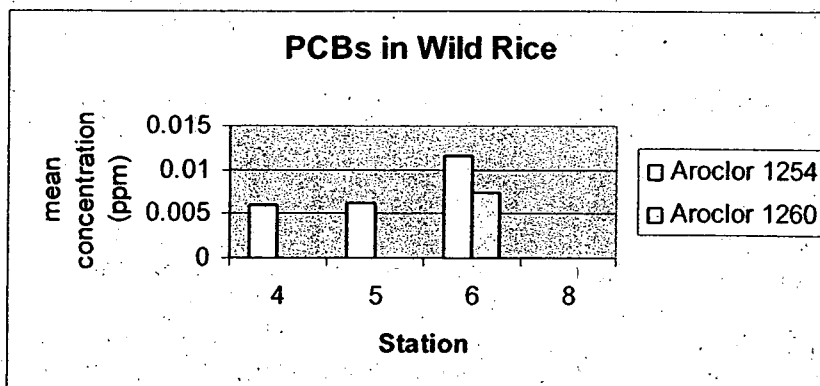


Figure 19. Mean PCB concentrations detected in wild rice in the study area.

6.0 CONCLUSIONS

The dissolved oxygen levels and pH of surface water at Site stations (Stations 3, 4, 5, & 6) in Hessian Run met the state criteria for FW2 waters. Concentrations of total recoverable lead at all Site stations were below the acute aquatic life protection standard, but three of the four Site stations (3, 5, and 6) exceeded the chronic aquatic life protection criteria. Sediment sampling revealed that concentrations of lead in sediments at all Site stations were greater than lead concentrations at all reference stations. Sediment lead concentrations exceeded the Lowest Effects Level (LEL) at all Site stations, and lead concentrations at three of four Site stations (3, 4, and 6) also exceeded the Severe Effects Level (SEL). While lead concentrations at station 6 only slightly exceeded the SEL, lead concentrations at stations 3 and 4, respectively, greatly exceeded the SEL by 1 to 1.75 orders of magnitude. Based on results presented in the recent Remedial Investigation Report (RIR - Berger, 2004), the locations of stations 3 and 4 coincide with those of the heaviest concentrations of lead bearing battery casings previously deposited along the Hessian Run shoreline. Concentrations of Aroclor 1254 and Aroclor 1260 detected at all four Site stations exceeded the LEL, but did not exceed the SEL. Concentrations of these two PCB congeners at Site Station 4 were approximately ten times higher than concentrations detected at all other stations. Site Station 4 also contained another PCB that was not detected at any other station in the study area.

Sediment toxicity testing through acute exposure experiments indicated elevated toxicity of some Site station sediments relative to reference stations and control sediment. Sediments from Station 4 resulted in 100% mortality of amphipod test organisms, while Site Station 6 had significantly less test organism survival than the control sediment. Survival and growth at the other two Site stations (3 and 5) were not significantly different than survival in the control sediment. In the midge testing, sediment from Site Station 4 again resulted in 100% mortality of test organisms, while the other three Site stations all had significantly less test organism survival than control sediment. In both the amphipod and midge testing, several of the reference sites also had significantly less survival than control sediment. Chronic exposure experiments using larval midges as test organisms resulted in significantly less adult emergence at three of the four Site stations than the reference stations. Site Station 3 also had a significantly greater number of days before first emergence than the reference stations.

Four fish species were caught at Site stations, while twelve species were caught at the reference stations. Mean fish diversity at the four Site stations was considerably lower than at the six reference stations upstream and downstream in Hessian Run and in Woodbury Creek. The fish communities at the Site stations consisted almost entirely of omnivores, whereas fish communities at the reference stations, while also primarily composed of omnivores, had a greater percentage of water-column feeders and top carnivores. In addition, three species not encountered in a 1977 fish survey of the study area (Hastings and Good, 1977) were caught during this study.

Five benthic macroinvertebrate taxa were collected at the Site stations, while nine taxa were collected at the reference stations. Mean taxa diversity of the Site stations was slightly lower than that of the reference stations. The benthic macroinvertebrate communities at the Site stations and reference stations consisted almost entirely of deposit feeders, with few filter feeders or carnivores. Benthic taxa at the reference stations were primarily pollution-tolerant, but some moderately tolerant and sensitive taxa were present, while Site stations consisted entirely of pollution-tolerant organisms.

Similar concentrations of lead were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations. PCBs were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations at similar concentrations. Concentrations of lead detected in the wetland plants spatterdock and wild rice at Site stations were considerably higher than those of the Woodbury Creek

reference stations. Concentrations of two PCB congeners (Aroclor 1254 and Aroclor 1260) detected in these plant species at Site stations were also considerably higher than at the reference stations. In earthworm tissue, lead concentrations at the Site stations were over ten times greater than at the reference station. Concentrations of the two PCB congeners detected in earthworms at Site stations were also much higher than at the reference station.

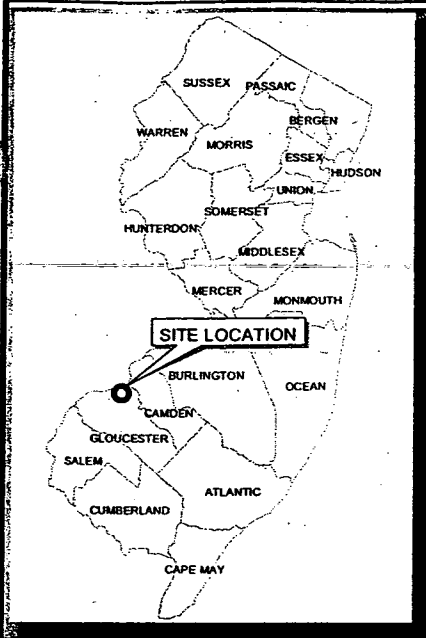
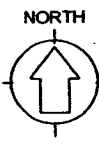
In summary, concentrations of total recoverable lead in surface water samples at three of the four Site stations (3, 5, and 6) exceeded NJDEP's chronic aquatic life protection criteria. Sediment lead concentrations at three of the four Site stations (3, 4, and 6) exceeded NJDEP's SEL values. Sediments at Site Stations 3 and 4, which both had sediment lead concentrations of over 2,000 ppm, exhibited high benthic organism toxicity relative to other stations in the study area; station 4 exhibited the highest mortality rate (100% mortality) for both amphipods and midges. These two stations with high lead concentrations and toxicity levels are located immediately adjacent to the heaviest concentrations of shoreline battery casing deposits (see Figure 20). As evidenced by the field assessment results, benthic organisms do occur in the sediment at Site Stations 3, 4, 5, and 6, albeit at lower diversity than the reference stations. However, benthic organisms in fine-grained sediment such as that present in the study area typically occur within the top few centimeters of sediment. Because the sediment used for sediment contaminant sampling and sediment toxicity testing was collected from a composited depth of 0-6", the deeper portion of the sample may contain contaminant levels toxic to the benthos. Consequently, disturbance and exposure of deeper sediment containing high levels of contaminants would adversely impact the aquatic biota.

Concentrations of lead and PCBs in fish and clam tissue were similar at the Site and reference stations. This result is not unexpected, considering the natural history of the organisms. Fish are mobile and unlike the benthos, are not resident at a particular station. Therefore, they would not be exposed exclusively to water and sediment quality conditions at a particular site. The clams are resident members of the benthic community, but are filter feeders. In addition, the relatively small size of the clams that were collected and analyzed indicates that the individuals represented a newly settled year class.

Lead and PCB concentrations in wetland plant tissue were much higher at the Site stations than the reference stations, suggesting that pollutants may be located more deeply in the sediment where plant roots can uptake them. Herbivores inhabiting this area would appear to be at risk of consuming plants with elevated concentrations of pollutants.

Earthworm tissue lead and PCB concentrations were much greater at the three upland Site stations (Stations 4E, 4.5E & 5E) than the off-site reference station (8E). The three lead and PCB impacted upland sampling stations were located within areas documented in the RIR (Berger, 2004) to contain surficial and buried mixed waste materials containing lead bearing battery casings and PCB contaminated soils. Earthworms are a major food source for shrews and moles, as well as a variety of bird species, and may represent a pathway through which lead and PCBs are passed onto higher trophic levels in the food chain.

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- MATTEO IRON AND METAL SITE
- AQUATIC SAMPLING STATION
- UPLAND SAMPLING STATION
- ⊞ BATTERY CASING LOCATION

SOURCE: NJDEP DIGITAL ORTHOPHOTOS, 1995/1997.

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State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection
Division of Remediation Management & Response
401 E. State Street, PO Box 413
Trenton, New Jersey 08625

Bradley M. Campbell
Commissioner

February 2, 2005

USEPA - Region II
2890 Woodbridge Avenue (MS 211)
Edison, NJ 08837-3679

Attn: Richard Salkie, Chief, Removal Action Branch

Re: Matteo Iron and Metal Site

Dear Mr. Salkie:

This is in reference to the Matteo Iron & Metal Site (Site), located in West Deptford Township, Gloucester County, New Jersey.

At the request of Edward Putnam, Assistant Director of the Remedial Response Element for the New Jersey Department of Environmental Protection (NJDEP), the enclosed RASE Summary Presentation: 12/09/04 for your information for this Site. The NJDEP's consultant, Louis Berger Group, Inc. (Berger) assembled this document for an NJDEP management briefing in December 2004. This document is a summary of the Draft Remedial Action Selection Evaluation following the Remedial Investigation, which was also performed by Berger. The NJDEP's Bureau of Environmental Measurements and Site Assessment is currently undertaking to pre-score the site prior to submitting any formal request to the United States Environmental Protection Agency. As such, this summary is being submitted to you for your information at this time.

Should you have any questions or require additional information, please do not hesitate to contact me at (609) 633-6621.

Sincerely,

Carlton W. Bergman
Bureau of Design & Construction

Enclosure

c: Edward Putnam, RRE
William Lowry, BEMSA

REMOVAL ACTION BR.

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State of New Jersey

Department of Environmental Protection

Richard J. Codey
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Commissioner

2005 JUN 10 PM 2:46
DIRECTOR'S OFFICE

U.S. EPA REGION II
EMERGENCY RESPONSE DIV.

U.S. EPA REGION II
2005 JUN 10 PM 4:1
REMOVAL ACTION BR.

William McCabe, Acting Director
Emergency and Remedial Response Division
U. S. Environmental Protection Agency, Region II
290 Broadway
New York, New York 10007-1866

JUN 6 2005

Dear Director McCabe:

The New Jersey Department of Environmental Protection (Department) hereby submits the Matteo Iron and Steel Site (Matteo Site) for CERCLA removal action consideration. The following information provides a brief case history and supports the removal request.

The Matteo Site consists of 80 acres in West Deptford Township, Gloucester County, New Jersey. The Site is bordered by a mobile home park to the south, the Horseshoe Branch of Hessian Run to the north, undeveloped wetland property to the west, and Route 130 to the east.

The Matteo Site was primarily used as a scrap yard, but a significant part of the business during the 1960s and 1970s was the recycling of lead and acid batteries. Casings generated from this operation were disposed of in the adjacent wetlands and the Horseshoe Branch of Hessian Run. The casings are visible today protruding from the stream embankment.

The Department recently completed a Remedial Investigation of the Matteo Iron and Steel Site. The results of this investigation show significant public health and environmental concern. Levels of lead in the Horseshoe Branch of the Hessian Run range from non-detect to 35,200 milligrams per kilogram. Bioassay studies show that these levels are toxic to benthic organisms. Additionally, our investigation has found an area of significant PCB contamination at the Matteo Site. Trespassers have been observed at the site; trails throughout the site indicate the likelihood for the local population to come in contact with these contaminants.

The Department is formally requesting that the USEPA evaluate the Matteo Site to determine if conditions at the site qualify the site for an EPA removal action to address the potential for human contact. Additionally, the Department would like to include the existing adverse environmental effects of contamination in the Horseshoe Branch of the Hessian Run in the USEPA action.

A copy the Remedial Investigation has been forwarded to your staff under separate cover. Should your staff require additional information please have them contact Ed Putnam, Assistant Director of the Remedial Response Element at (609) 984-2990.

Sincerely,


Leonard J. Romino, Acting Director
Division of Remediation Support

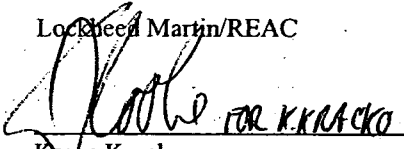
C: George Zachos, Accelerated Cleanup Manager, EPA
Richard Salkie, Branch Chief, Response and Prevention Branch, EPA
Bruce Sprague, Branch Chief, Removal Action Branch, EPA
Chad Michael Bruner, Director, Gloucester County Department of Health and Institutions
Ed Putnam, Assistant Director, Remedial Response Element, DEP
Ronald Corcory, Assistant Director, Discharge Response Element, DEP
Mark Pedersen, Bureau Chief, BRMINCA, DEP
Clare Whittaker, Supervisor, BRMINCA, DEP

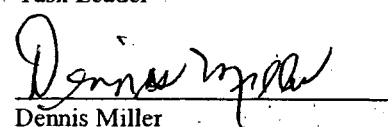
**FINAL REPORT
MATTEO IRON AND METAL SITE
ECOLOGICAL RISK ASSESSMENT
WEST DEPTFORD, NEW JERSEY
JULY 2005**

U.S. EPA Work Assignment No.: 0-148
Lockheed Martin Work Order No.: EAC00148
U.S. EPA Contract No.: EP-C-04-032

Prepared by:

Lockheed Martin/REAC


Karen Kracko
Task Leader


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7/14/05
Date

7/14/05
Date

Prepared for:

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Work Assignment Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

AUF	Area Use Factor
BM	Benchmark
BTAG	Biological Technical Assistance Group
BW	Body weight
°C	Degrees centigrade
C _F	Concentration of contaminant in food
C _S	Concentration of contaminant in sediment/soil
C _w	Concentration of contaminant in water
cm	Centimeter
COPC	Contaminant of Potential Concern
DO	Dissolved oxygen
d.w.	Dry weight
e.g.	For example
EC ₅₀	Effective Concentration for 50% of exposed organisms
ED ₅₀	Effective Dose for 50% of dosed organisms
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ERT	Environmental Response Team
etc.	Etcetera
ft	Feet
FIR	Food ingestion rate
g	Grams
GPS	Global Positioning System
≥	Greater than or equal to
HQ	Hazard Quotient
ID	Identification
i.e.	In other words
kg	Kilogram
Pb	Lead
L	Liter
LC ₅₀	Lethal Concentration for 50% of exposed organisms
LEL	Lowest effect level
LD _{Lo}	Lowest Lethal Dose
LOAEL	Lowest Observed Adverse Effect Level
LD ₅₀	Lethal Dose for 50% of exposed organisms
Hg	Mercury
MDL	Method detection limit
μ	Micron
μS/cm	Microsiemens per centimeter
mg/kg BW/day	Milligrams per kilogram body weight per day
mg/L	Milligrams per liter
mm	Millimeter
m	Meter
MATC	Maximum Acceptable Toxicant Concentration
μg/kg	Micrograms per kilogram
μg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mL	Milliliter
NIST	National Institute for Standards and Technology
NJAC	New Jersey Administrative Code

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

NJDEP	New Jersey Department of Environmental Protection
NOAEL	No Observed Adverse Effect Level
NTU	Nephelometric Turbidity Units
Pb	Lead
PCB	Polychlorinated Biphenyls
PEM1	Persistent wetlands
%	Percent
PFO1	Palustrine forested broad-leaved deciduous wetlands
ppm	Parts per million
ppt	Parts per thousand
R1EM	Riverine tidal emergent wetland
R1OW	Riverine tidal open water
REAC	Response, Engineering and Analytical Contract
RI	Remedial Investigation
SEL	Severe effect level
sp.	Species
SRM	Standard reference materials
SRT	Standard reference toxicant
std units	Standard units
SLERA	Screening Level Ecological Risk Assessment
SIR	Sediment/Soil ingestion rate
SOP	Standard Operating Procedure
SWQS	Surface Water Quality Standards
TRV	Toxicity Reference Value
TAL	Target Analyte List
TLm	Threshold Limit - median
TOC	Total Organic Carbon
U.S.	United States
WIR	Water ingestion rate
WA	Work Assignment
ww	Wet weight

1.0 INTRODUCTION

1.1 Site Background

The Matteo Iron and Metal Site is an 80-acre property located in West Deptford, Gloucester County, New Jersey (NJ). It is bordered by Woodbury Creek and Hessian Run to the west, United States (U.S.) Highway 130 to the south, and Belmont Avenue to the east. The Site was historically used for farming and is currently used as a scrap metal recycling facility. The majority of the site is heavily vegetated, undeveloped land. Based on available records, the Matteo family operated an unregistered landfill and junkyard, and a metals recycling facility at the site since 1961. From 1971 to 1985, a "sweating fire box" was used to melt lead (Pb) battery terminals for Pb reclamation (Berger 2004a). Currently, the junk yard accepts primarily non-automotive scrap, but it formerly accepted large numbers of automotive batteries. The landfill accepted industrial and domestic waste; a large portion of the landfill capacity was devoted to automotive battery casings. These casings are primarily located along the banks of Hessian Run (NJDEP 1996).

As a result of the above activities, Pb has been identified as the primary contaminant of potential concern (COPC) in surface soils, surface water, sediment and groundwater at this site. Polychlorinated biphenyl (PCB) contamination has also been identified in some surface soils and sediments.

1.2 Site Description

The Matteo Iron and Metal Site is located at the confluence of Woodbury Creek and Hessian Run, which are tidally influenced at this location. Tidal fluctuations range from approximately 5.4 feet at neap tide to approximately 6 feet at spring tides. At low tide, Woodbury creek is approximately 10 feet deep while Hessian Run is a narrow stream less than a foot deep (Berger 2004b). Both Woodbury Creek and Hessian Run are classified as FW-2NT/SE2 waterways in which there may be a freshwater/saltwater interface as determined by salinity measurements at mean high tide. However, salinity measurements in both streams taken during the Remedial Investigation (RI) averaged 0.01 parts per thousand (ppt), indicating a freshwater habitat (Berger 2004b). The marshes associated with Woodbury Creek and Hessian Run are freshwater tidal marshes. These areas have been identified by the Atlantic Coast Inventory as part of the Delaware River Estuary (NJDEP 1996).

1.3 Purpose and Scope of Work

The purpose of this investigation was to conduct an ecological risk assessment (ERA) using existing site-specific data. Available data included PCB and Pb concentrations in surface soil (Pb only), sediment, water (Pb only), and tissue (fish, clam, earthworm and plant); sediment toxicity tests conducted with *Hyalella azteca* and *Chironomus tentans*; a benthic community survey; and a fish community survey (Berger 2004b). No additional data were collected.

2.0 SCREENING LEVEL RISK ASSESSMENT (Steps 1 and 2, U.S. EPA 1997)

The purpose of a screening-level ecological risk assessment (SLERA) is to determine whether site-related ecological effects are negligible, or whether there is a potential for adverse ecological effects and a more detailed ERA is needed.

2.1 Screening-Level Problem Formulation and Ecological Effects Evaluation

The initial step in the SLERA is to determine the nature and extent of site-related contamination and to characterize potential ecological receptors. Based on known site history and existing chemical data, Pb and PCBs are the COPCs at this site. Lead and PCBs are present in surface soils and sediments on-site; Pb is also present in surface water and groundwater (Berger 2004a).

2.2 Screening-Level Exposure Estimate and Risk Calculation

In the second step of the SLERA, risk was estimated by comparing Pb and PCB concentrations measured on-site with ecological screening benchmark (BM) values. Lead concentrations measured in surface water were compared to the New Jersey Department of Environmental Protection (NJDEP) Surface Water Quality Standards (SWQS), New Jersey Administrative Code (N.J.A.C.) 7:9B. Lead and PCB concentrations measured in sediment samples were compared to the Lowest Effect Level (LEL) and Severe Effect Level (SEL) Sediment Quality Criteria cited in NJDEP (1998).

For data collected in the RI, the concentration of Pb in most of the unfiltered surface water samples (20 of 24) exceeded the SWQS for ecological receptors (Table 5-32; Berger 2004a). In general, Pb concentrations measured in unfiltered samples collected at low tide exceeded concentrations in samples collected at the same location at high tide. Lead concentrations in two of the filtered samples exceeded the SWQS for ecological receptors (Table 5-32; Berger 2004a). In sediment, measured Pb concentrations exceeded the LEL at all three depths sampled (0-6 inches, 12-24 inches, and 24-36 inches) throughout the study area. The SEL was also exceeded at all three depth intervals; with the exception of one sample, all SEL exceedances were within Hessian Run. The highest Pb concentration (greater than 15,000 milligrams per kilogram [mg/kg]) was detected along the central portion of the north shoreline of the site (Sample T9-E, Table 5-26; Berger 2004a).

The LEL and SEL sediment criteria for PCBs are Aroclor-specific; Aroclor 1254 was the most prevalent Aroclor measured. Detected concentrations of Aroclor 1254 exceeded the LEL at all three depths sampled. The majority of Hessian Run was affected, with the exception of the central channel portions. In Hessian Run, the extent of the LEL exceedance is greater in the top two feet of sediment than in the 24- to 36-inch depth interval. In Woodbury Creek, the greatest extent of LEL exceedance is in the 24- to 36-inch interval. At two sample locations along the central portion of the north shoreline adjacent to the Site, PCB concentrations in sediment exceeded the SEL (Sample T9-E and T11E; Table 5-27; Berger 2004a).

For data collected in the Aquatic Biota Study (Berger 2004b), total Pb concentrations in surface water samples did not exceed acute aquatic life protection criteria but did exceed chronic aquatic life protection criteria at six of ten sample stations. The concentration of Pb in sediment exceeded the LEL at all ten sample locations, and the concentration of Pb in sediment exceeded the SEL at three sample stations (located adjacent to the site). The concentration of PCBs measured at eight of the ten sample locations exceeded the LEL, but none exceeded the SEL (Berger 2004b).

Based on the SLERA, further evaluation of risk from site-related Pb and PCBs is required.

3.0 PROBLEM FORMULATION (Steps 3 and 4, EPA 1997)

The purpose of problem formulation is to establish the goals, extent, and focus of the ERA for the site. Problem formulation constitutes Steps 3 and 4 of the United States Environmental Protection Agency (EPA) guidance. In the problem formulation phase, the questions and issues that need to be addressed are defined based on potentially complete exposure pathways and ecological effects. The problem formulation presented here was developed according to the guidelines established in the Ecological Risk Assessment Guidance for Superfund (U.S. EPA 1997).

3.1 Contaminants of Potential Concern

Based on known site history and existing chemical data from site investigations, Pb and PCBs were selected as the COPCs at this site.

3.2 Ecological Effects

A literature search was conducted to obtain information on the ecological effects of Pb and PCBs. If data were available, attempts were made to include toxicity information for species of concern that may be present at or

near the site. Toxicological profiles for Pb and PCBs are presented in Appendix A.

3.3 Ecosystems Potentially at Risk

The objective of the exposure assessment was to determine the pathways and media through which receptors may be exposed to site contaminants. Potential exposure pathways are dependent on habitats and receptors present on-site, the extent and magnitude of contamination, and environmental fate and transport of COPCs.

The Matteo Iron and Metal Site is located in West Deptford, NJ (Figure 1), and is comprised of forest and meadow habitats, extensive freshwater tidal wetlands, a metal recycling area, a junkyard, and an inactive landfill. The upland areas are comprised of approximately 55 acres of forested habitat, scrub/shrub habitat, and open fields. The forest habitat is dominated by red oak, post oak, white oak and black cherry in the canopy. Stand age is variable, with older stands along the border of the Site where disturbance has been minimal. The open meadow habitat is in the center of the Site, and is associated with the former agriculture activities. Dominant plants in this habitat include small white aster, grasses, and mugwort. Four types of wetlands were observed on-site: riverine tidal emergent wetlands (R1EM), palustrine emergent, persistent wetlands (PEM1), palustrine forested broad-leaved deciduous wetlands (PFO1), and riverine tidal open water (R1OW) (Berger 2004a).

The Matteo Iron and Metal Site may provide habitat for a variety of wildlife species due to the diversity of habitat types present and the location adjacent to an extensive freshwater tidal marsh. Bird and mammal species observed utilizing the Site during the RI and Aquatic Biota Study are listed below:

BIRDS:

Red-tailed hawk (*Buteo jamaicensis*)
 Mallard duck (*Anas platyrhynchos*)
 American crow (*Corvus brachyrhynchos*)
 Belted kingfisher (*Ceryle alcyon*)
 Blue jay (*Cyanocitta cristata*)
 Canada goose (*Branta canadensis*)
 Downy woodpecker (*Dicoides pubescens*)
 Carolina chickadee (*Poecile carolinensis*)
 Great horned owl (*Bubo virginianus*)
 Herring gull (*Larus argentatus*)
 House sparrow (*Passer domesticus*)
 Killdeer (*Charadrius vociferus*)
 Mockingbird (*Mimus polyglottos*)
 Mourning dove (*Zenaida macroura*)
 Northern cardinal (*Cardinalis cardinalis*)
 Red-winged blackbird (*Agelaius phoeniceus*)
 Song sparrow (*Melospiza melodia*)
 White-breasted nuthatch (*Sitta carolinensis*)
 Great egret (*Ardea alba*)
 Osprey (*Pandion haliaetus*)
 Common tern (*Sterna hirundo*)
 Cormorant (*Phalacrocorax auritus*)

MAMMALS:

Eastern gray squirrel (*Sciurus carolinensis*)
 White-tailed deer (*Odocoileus virginianus*)
 Muskrat (*Ondatra zibethicus*)
 Cottontail rabbit (*Sylvilagus floridanus*)

Bird species not observed on-site during the field investigations but that would likely utilize the creeks and associated tidal flats and marsh include shorebirds, waterfowl and wading birds. Some wetland-dependant species may utilize the wetlands during breeding season. Other species may utilize the tidal marshes during migration for resting and feeding.

3.4 Assessment Endpoints

Assessment endpoints are explicit expressions of the actual environmental values (i.e., ecological resources) that are to be protected. Valuable ecological resources include those without which ecosystem function would be significantly impaired or those providing critical resources (e.g., habitat). Appropriate selection and definition of assessment endpoints are critical to the utility of a risk assessment as they focus risk assessment design and analysis. It is not practical or possible to directly evaluate risks to all of the individual components of the ecosystem on-site, so assessment endpoints are used to focus the risk assessment on particular components of the ecosystem that could be adversely affected by the contaminants associated with the site. In general, the assessment endpoints selected for the site are aimed at the viability of aquatic and terrestrial populations and organism survivability.

Each assessment endpoint was chosen in an attempt to evaluate and protect the various communities that utilize the aquatic, wetland and upland habitats present on the Matteo Iron and Metal Site. By protecting each of these assessment endpoints, the aquatic and terrestrial ecosystems should be protected based on the concepts of trophic dynamics/energy transfer and population and community dynamics. The concept of trophic dynamics is based on the assumption that plants and animals can be placed into feeding groups or trophic levels, where the energy from one level can be passed onto the level above it, thereby keeping the system in a state of equilibrium (Smith 1980). An example of a simple trophic level transfer would be a plant (primary producer), which is eaten by an herbivore, which is eaten by a carnivore. Trophic/energy transfer is an important consideration when assessing ecosystem health, as deleterious effects to any one level may affect the overall energy budget of the system. In a system impacted by contaminants, trophic transfer takes on another level of importance as energy transfer may now include the potential transfer of contaminants up the food chain through bioaccumulation/biomagnification.

The concepts of population and community dynamics are also integral to the concept of trophic dynamics. A population may be defined as a group of individuals of the same species within an ecosystem. Populations occupy specific niches in the community and therefore within the energy budget of the ecosystem. As such, population level effects (factors affecting mortality, reproduction, immigration, etc.) are critical to energy transfer and community dynamics. A community may be defined as a group of populations living together in an environment that interact through competition, predation, mutualism, etc. Community interactions influence community attributes such as species abundance and diversity, which are critical parameters in the assessment of ecosystem structure and energy transfer. Protection of an ecosystem must take into consideration trophic, population, and community dynamics.

While an assessment endpoint focuses primarily on specific effects to a given population, it is with an understanding that the population does not exist within a "black box", but rather interacts with and affects other populations, the community, and the trophic dynamics of that community and ecosystem. For example, some of the assessment endpoints chosen for this ERA examine populations that function as both predators and prey. Predation, while critical to energy transfer in the system, also plays an important role in regulating and maintaining population size and species abundance and diversity. For example, piscivorous/aquatic feeding birds prey on fish and benthic organisms, thereby potentially affecting the density and diversity of these populations and communities. Conversely, the piscivorous/aquatic feeding birds may also serve as prey items to upper level carnivores and contribute to regulating the density and diversity of upper trophic levels. The concept of energy transfer is critical, and will be discussed individually for each endpoint. Each endpoint relates to some population or community level in a system where protection of the given endpoint will help preserve the overall function and integrity of the trophic, population, and community dynamics. More specifically, the overall assessment endpoint for this ERA is viability of the aquatic, wetland and terrestrial

ecosystems associated with the Matteo Iron and Metal site. As such, each of the specific assessment endpoints listed are sub-categories of this overall endpoint. It is through the protection of these various populations and communities that the overall health of the system is ensured. The assessment endpoints, testable hypotheses, and measurement endpoints are summarized below.

3.4.1 Assessment Endpoint No. 1: Viable Tidal Flat Community Structure and Function

The functioning of a tidal flat has a direct impact on the health of the entire ecosystem associated with the tidal flat. The tidal flat provides exclusive habitat and refuge for many species. Small fish move into the shallows as a refuge from predatory fish. Tidal flats function as nurseries for estuarine organisms, provide food and refuge from predators, and play an important role in energy flow, nutrient cycling, and organic matter processing. Biota utilizing the tidal flat often rely extensively on the resources (e.g., forage) available during high tide when fish move to the tidal flat to feed on the resident community. At low tide, birds and some mammals move onto the tidal flat to feed.

Alteration of the community structure can result in a loss of forage species which can result in a loss of the functionality of the system in supporting the growth and development of other members of the tidal flat community. For example, if large invertebrates are absent from the tidal flat, there may be effectively no food for foraging birds at low tide or larger fishes at high tide.

The benthic macroinvertebrate community also plays a role in the tidal flat community. The benthic macroinvertebrate community is typically diverse taxonomically, morphologically, and physiologically, and often consists of numerically abundant populations. Additionally, the benthic macroinvertebrate community plays a key role in ecosystem functions such as nutrient cycling and organic matter processing, and is a food resource for the pelagic community, including fish, as well as semiaquatic organisms such as birds and mammals.

The benthic macroinvertebrate community was determined to be of concern in the tidal flats due to its role in energy flow and materials cycling, its potential for exposure to contaminants, and its role as a food source for higher trophic level organisms.

3.4.2 Assessment Endpoint No. 2: Tidal Flat Nursery and Refuge Functioning

Tidal flats function as nursery and refuge areas for small and developing aquatic organisms. These organisms may include developing and growing fishes and young fishes migrating to coastal bays. In addition, many other young and developing organisms utilize tidal flats for refuge or protection from predators or avoidance of adverse environmental conditions (e.g., moving into quiet waters to rest). Examples of species in the Delaware River system which use tidal flats for their nursery function and as a migration pathway are American shad (*Alosa sapidissima*) and striped bass (*Morone saxatilis*).

Fish serve a vital role in nutrient and energy transfer within an aquatic system. Specifically, fish act as a link between aquatic and terrestrial ecosystems and between the benthic and pelagic environments. Fish that consume benthic organisms are consumed by other fish, who are in turn consumed by terrestrial organisms such as mammals and birds. These predator-prey interactions represent a transfer of energy from and within the aquatic ecosystem. Since the number of organisms supported at any position in a food chain depends upon the energy supply available, the role of energy transfer played by fish is integral to the productivity of an aquatic ecosystem. Furthermore, since energy and nutrient cycles are delicately balanced, even a small decline in the fish population can have detrimental impacts on the balance of energy within an ecosystem.

Fish are also important recreationally and commercially. It has been shown that declines in fish populations associated with chemical contamination have adversely affected commercial and recreational fishing industries in many areas of the country (Natural Resource Council 1992; Miller

et al. 1993). In some areas this has had a major impact on local economies due to losses from decreased tourism and decreased revenues from the commercial sale of fish.

The fish community was determined to be of concern due to its role in energy flow, their role as a food source for higher trophic level organisms, and their potential for exposure to contaminants.

3.4.3 Assessment Endpoint No. 3: Viability and Function of the Piscivorous Bird Community

Piscivorous birds are upper trophic level organisms that feed primarily on fish and invertebrates. This assessment endpoint focuses on those avian species which would utilize the tidal flat for feeding, and are important in the maintenance of a balanced ecosystem and in the nutrient and energy cycles between aquatic and terrestrial systems. Since nutrients and energy are limiting factors in the production of an ecosystem, the transfer of energy from an aquatic to a terrestrial system is essential.

Piscivorous birds are upper trophic level predators, and would be susceptible to exposure to contaminants which bioaccumulate in prey organisms. Fish have been shown to accumulate contaminants that are present in aquatic ecosystems. Therefore, birds that consume fish have the potential for exposure and accumulation of large concentrations of contaminants in their tissues.

Additionally, the Delaware Bay is an important area for nesting and wintering bald eagles. The bald eagle is listed as threatened on the Federal Endangered Species List and as endangered on the State Endangered Species List. The inclusion of the bald eagle as an endpoint in this ERA does not initiate a formal or informal consultation as defined by the Endangered Species Act. This receptor was included because available information indicated that it may use the area surrounding the site for forage. Although the birds are opportunistic, a large percentage of their diet is comprised of fish. The NJDEP (2004) indicates that there is a nesting pair of bald eagles located at the mouth of Mantua Creek at the Delaware River. This nest is approximately 3 miles south of the Matteo Iron and Metals site. There are also nests further south at the mouth of Raccoon Creek and to the north in Camden County, both located along the Delaware River. In addition, a review of the NJDEP (2005) Landscape Project critical habitat maps indicates that the bald eagle foraging area encompasses both Woodbury Creek and Hessian Run, adjacent to the Matteo Iron and Metals site.

Therefore, an evaluation will be conducted to determine the risk specifically to this species from the ingestion of fish collected adjacent to the site.

3.4.4 Assessment Endpoint No. 4: Viability and Function of the Piscivorous Mammal Community

This assessment endpoint is aimed at the viability and function of piscivorous mammal populations at this Site. Piscivorous mammals play an important role in energy flow between aquatic and terrestrial systems, and may serve as a food resource for higher trophic level organisms.

Piscivorous mammals are upper trophic level organisms that rely primarily on fish as forage. Foraging behavior of piscivorous mammals represents a pathway by which nutrients and energy are transferred from aquatic to terrestrial ecosystems. In addition to contributing to aquatic and terrestrial energy flow pathways, the predation of fish regulates fish population size and species abundance and diversity. Conversely, piscivorous mammals also serve as prey items for upper trophic level predators. Predation by and of piscivorous mammals therefore contributes to balanced populations of fish and other aquatic and terrestrial organisms, a balance that is essential for normal ecosystem functioning.

Since piscivorous mammals are upper trophic level predators, they are especially susceptible to exposure to certain contaminants which can bioaccumulate in the organisms upon which they feed. The higher the trophic level of the food chain, the more concentrated the contaminants in the tissues become due to bioaccumulation or biomagnification. In a freshwater system, mammals are common

predators of fish. Fish have been shown to accumulate contaminants that are present in aquatic ecosystems. Therefore, mammals that consume fish have the potential to accumulate large concentrations of contaminants in their tissues.

The piscivorous mammal community was determined to be of concern due to its role in energy flow, their potential for exposure to contaminants, and their role as a food source for higher trophic level organisms. Based on the above discussion, it was determined that viability and function of the piscivorous mammal community was a valid assessment endpoint for this risk assessment.

3.4.5 Assessment Endpoint No. 5: Viability and Function of the Omnivorous Bird Community

Omnivorous birds are organisms that rely on both animal tissue and plant matter for forage. The foraging behavior of omnivorous birds represents a pathway by which nutrients and energy are transferred from lower to higher links in the food chain. For example, invertebrates are consumed by mid-level omnivores which are in turn consumed by an upper level consumer. Omnivores may also transfer energy from the detrital food chain to the grazing food chain by consuming detritivores (e.g., millipedes).

Since omnivorous birds are mid- to trophic level predators, they are susceptible to exposure to contaminants which bioaccumulate or biomagnify in the organisms upon which they feed. Omnivorous birds consume vegetation and invertebrates which have been shown to accumulate certain contaminants that are present in terrestrial ecosystems. Therefore, birds that consume these items have the potential to accumulate large concentrations of contaminants in their tissues.

Some birds are resident year-round and some are migratory. The variable mobility of potential avian receptors, relatively large home range, variable diet, and often seasonal residency, suggest that the potential for exposure and the identification of specific exposure routes and concentrations are associated with some uncertainty. Nonetheless, the avian omnivorous community is of concern due to their role in energy transfer and regulating populations, and the potential for exposure and adverse effects in a mid-to higher trophic level organism. Therefore, it was determined that viability and function of the omnivorous avian community was a valid assessment endpoint for this risk assessment.

3.4.6 Assessment Endpoint No. 6: Viability and Function of the Omnivorous Mammal Community

Omnivorous mammals are organisms that rely on both plant and animal matter for forage. The role of an omnivore is essential to an ecosystem as they transfer the energy available to a varying number of trophic levels. In addition to contributing to energy pathways in a terrestrial system, omnivore foraging on small mammals and vegetation regulates small mammal and vegetation density, species abundance, and diversity. Conversely, omnivorous mammals may also serve as prey items for upper trophic level predators. Predation by and of omnivorous mammals therefore contributes to a balanced small mammal and vegetative community, as well as regulating other mid- to upper trophic level terrestrial organisms. This balance is essential for normal ecosystem functioning.

Since omnivorous mammals are mid- to upper trophic level consumers, they are susceptible to exposure to contaminants which can bioaccumulate in the organisms upon which they feed. The higher the trophic level of the food chain, the more concentrated the contaminants in the tissues become due to bioaccumulation or biomagnification. In a terrestrial system, omnivorous mammals are common predators of small mammals and plants; both have been shown to accumulate contaminants that are present in terrestrial ecosystems. Therefore, mammals that consume small mammals or plants have the potential to accumulate contaminants in their tissues.

Based on their role in energy transfer and regulating populations, as well as the potential for exposure and adverse effects in mid-to upper trophic level organisms, the viability of the omnivorous mammal

community was selected as a valid assessment endpoint for this risk assessment.

3.4.7 Assessment Endpoint No. 7: Viability and Function of the Insectivorous Bird Community

This assessment endpoint is aimed at the viability and function of the soil invertebrate feeding bird populations at the Matteo Iron and Metal Site. Soil-invertebrate feeding birds are mid-trophic level organisms that rely primarily on soil invertebrates as forage. The foraging behavior of soil-invertebrate feeding birds represents a pathway by which nutrients and energy are transferred from lower to higher links in the food chain. For example, soil invertebrates are consumed by mid-level birds which are in turn consumed by an upper level consumer. Birds such as the American robin transfer energy from the detrital food chain to the predator food chain when they consume detritivores (e.g., earthworms).

Since some soil-invertebrate feeding birds are mid-trophic level predators, they are susceptible to exposure to contaminants which bioaccumulate in the organisms upon which they feed. The higher the trophic level of the food chain, the more concentrated the contaminants in the tissues become due to bioaccumulation or biomagnification. Soil invertebrates have been shown to accumulate contaminants that are present in terrestrial ecosystems. Therefore, birds that consume soil invertebrates have the potential to accumulate large concentrations of contaminants in their tissues. Additionally, soil invertebrates such as earthworms may contain large amounts of soil entrained in their gut, resulting in incidental exposure of soil-invertebrate feeding birds to contaminated soils.

Some birds are resident year-round and some are migratory. The variable mobility of potential avian receptors, relatively large home range, variable diet, and often seasonal residency, suggest that the potential for exposure and the identification of specific exposure routes and concentrations are associated with some uncertainty. Nonetheless, the soil-invertebrate feeding avian community is of concern due to their role in energy transfer and regulating populations, and the potential for exposure and adverse effects in a higher trophic level organism. Therefore, viability of the soil-invertebrate feeding avian community was determined to be a valid assessment endpoint for this risk assessment.

3.4.8 Assessment Endpoint No. 8: Viability and Function of the Insectivorous Mammal Community

This assessment endpoint is aimed at the viability and function of the insectivorous small mammal community at the Matteo Iron and Metal Site. Small mammals that consume soil invertebrates play a key role in ecosystem functions such as energy flow, and are an important food resource for higher trophic level species.

Soil invertebrate feeding mammals are mid-trophic level organisms that rely primarily on insects as forage. The foraging behavior of insectivorous mammals may represent a pathway by which nutrients and energy are transferred from lower to higher links in the food chain. For example, insects are consumed by mid-level insectivores (shrews) which are in turn consumed by an upper level consumer (marsh hawk). Insectivores also transfer energy from the detrital food chain to the grazing food chain when insectivores consume detritivores (e.g., earthworms).

Since soil invertebrate feeding mammals are mid-level predators, they are susceptible to exposure to contaminants which can bioaccumulate in the organisms upon which they feed. The higher the trophic level of the food chain, the more concentrated the contaminants in the tissues become due to bioaccumulation or biomagnification. In a terrestrial system, small mammals such as shrews are common predators of insects. Insects have been shown to accumulate contaminants that are present in terrestrial ecosystems. Therefore, mammals that consume insects have the potential to accumulate large concentrations of contaminants in their tissues.

The soil invertebrate feeding mammal community was determined to be of concern due to its role in

energy flow, their potential for exposure to contaminants, and their role as a food source for higher trophic level organisms. Based on the above discussion, it was determined that viability and function of the soil invertebrate feeding mammal community was a valid assessment endpoint for this risk assessment.

3.4.9 Assessment Endpoint No. 9: Viability and Function of the Herbivorous Mammal Community

This assessment endpoint is aimed at the viability and function of the herbivorous small mammal community at this Site. Herbivorous mammals play a key role in ecosystems functions such as energy flow, and are an important food resource for higher trophic level species.

Herbivorous small mammals are lower trophic level organisms that rely primarily on vegetation as forage. The role of herbivores is essential within an ecosystem as they transfer the energy available in plant tissue (primary producers) to animal tissue, and make it available to upper trophic level organisms.

Herbivorous mammals are susceptible to exposure to contaminants which can accumulate in and on plant tissues upon which they feed. Plants have been shown to accumulate contaminants that are present in terrestrial ecosystems. Therefore, mammals that consume plants have the potential to accumulate these contaminants within their tissues. In addition, because of their size, small mammals generally have small home ranges (Harestad and Bunnell 1979). The low mobility of small mammals which inhabit contaminated areas suggests a high potential for exposure, and enables specific exposure routes and concentrations to be identified with a high degree of certainty.

The herbivorous mammal community is of concern due to the potential for accumulation of contaminants and transfer to higher trophic level consumers, as well as for the potential for direct exposure and adverse effects. Additionally, small mammals are a large component of the terrestrial food chain base, representing an important food resource for carnivorous birds and mammals. Based on the above discussion, the viability and function of the herbivorous mammal community was determined to be a valid assessment endpoint for this risk assessment.

3.5 Testable Hypotheses

The testable hypotheses are specific risk questions that are based on the assessment endpoints. Based on the mechanism of contaminant toxicity, the number of exposure pathways that may exist for an assessment endpoint, or other factors, there may be more than one question for each assessment endpoint.

3.5.1 Assessment Endpoint No.1: Viable Tidal Flat Community Structure and Function

Are levels of site contaminants in sediment and surface water sufficient to cause adverse alterations to the structure and/or function of the tidal flat community?

3.5.2 Assessment Endpoint No. 2: Tidal Flat Nursery and Refuge Functioning

Are levels of site contaminants in sediment and surface water sufficient to cause adverse alterations to the nursery/refuge function of the tidal flat including migration pathways for fish?

3.5.3 Assessment Endpoint No. 3: Viability and Function of the Piscivorous Bird Community

Are levels of site contaminants in fish captured on-site sufficient to cause adverse toxic effects or reproductive impairment to piscivorous bird species utilizing the tidal flats, marshes or streams on-site?

3.5.4 Assessment Endpoint No. 4: Viability and Function of the Piscivorous Mammal Community

Are levels of site contaminants in fish captured on-site sufficient to cause adverse toxic effects or reproductive impairment to piscivorous mammals utilizing the tidal flats, marshes or streambanks on-site?

3.5.5 Assessment Endpoint No. 5: Viability and Function of the Omnivorous Bird Community

Are levels of site contaminants in vegetation and clams collected on-site sufficient to cause adverse toxic effects or reproductive impairment to omnivorous birds utilizing the tidal flats, marshes or streambanks on-site?

3.5.6 Assessment Endpoint No. 6: Viability and Function of the Omnivorous Mammal Community

Are levels of site contaminants in vegetation and clams collected on-site sufficient to cause adverse toxic effects or reproductive impairment to omnivorous mammals utilizing the tidal flats, marshes or streambanks on-site?

3.5.7 Assessment Endpoint No. 7: Viability and Function of the Insectivorous Bird Community

Are levels of site contaminants in soil invertebrates captured on-site sufficient to cause adverse toxic effects or reproductive impairment to soil invertebrate feeding bird species utilizing the upland areas on-site?

3.5.8 Assessment Endpoint No. 8: Viability and Function of the Insectivorous Mammal Community

Are levels of site contaminants in soil invertebrates captured on-site sufficient to cause adverse toxic effects or reproductive impairment to soil invertebrate feeding mammal species utilizing the upland areas on-site?

3.5.9 Assessment Endpoint No. 9: Viability and Function of the Herbivorous Mammal Community

Are levels of site contaminants in plants collected on-site sufficient to cause adverse toxic effects or reproductive impairment to herbivorous mammals utilizing the tidal flats, marshes or streambanks on-site?

3.6 Measures of Exposure and Effects

Measures of exposure and effects are quantifiable ecological characteristics that are related to the valued characteristics selected as assessment endpoints. They should be linked to the assessment endpoints by the mechanism of toxicity and the route of exposure. Measures of exposure are site-specific data on COPC concentrations; these are actual COPC concentrations that ecological receptors that utilize a site can be exposed to. Measures of effects are used to derive a quantitative estimate of potential effects, and to form a basis for extrapolation to the assessment endpoints.

Measures of exposure and effects were selected on the basis of the presence of receptors on the site, the presence of a complete exposure pathway, and the sensitivity of the receptor to the contaminants. The following attributes were selected to represent exposure pathways and assessment endpoints identified for the site.

3.6.1 Measurable Attributes for Assessment Endpoint No. 1: Viable Tidal Flat Community Structure and Function

Measures of Exposure

Concentrations of Pb and PCBs measured in surface water and sediments collected from Hessian Run and Woodbury Creek.

Measures of Effects

Results of site-specific studies that evaluated the community structure of the benthic macroinvertebrates inhabiting Hessian Run and Woodbury Creek.

Results from 28-day solid phase toxicity tests conducted using *Hyaella azteca*.

Results from 20-day solid phase toxicity tests conducted using *Chironomus tentans*.

3.6.2 Measurable Attributes for Assessment Endpoint No. 2: Tidal Flat Nursery and Refuge Functioning

Measures of Exposure

Determine the concentrations of Pb and PCBs in surface water and sediments collected from Hessian Run and Woodbury Creek.

Measures of Effects

Results of site-specific studies that evaluated the community structure of fish inhabiting Hessian Run and Woodbury Creek.

3.6.3 Measurable Attributes for Assessment Endpoint No. 3: Viability and Function of the Piscivorous Bird community

Measures of Exposure

Measured concentrations of Pb and PCBs in fish collected from locations on-site.

Measures of Effects

Through food chain models for the great blue heron (*Ardea herodias*) and bald eagle (*Haliaeetus leucocephalus*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to toxicity reference values (TRVs).

3.6.4 Measurable Attributes for Assessment Endpoint No.4: Viability and Function of the Piscivorous Mammal Community

Measures of Exposure

Measured concentrations of Pb and PCBs in fish collected from locations on-site.

Measures of Effects

Through food chain models for the mink (*Mustela vison*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to TRVs.

3.6.5 Measurable Attributes for Assessment Endpoint No. 5: Viability and Function of the Omnivorous Bird Community

Measures of Exposure

Measured concentrations of Pb and PCBs in vegetation and clams collected from locations on-site.

Measures of Effects

Through food chain models for the wood duck (*Aix sponsa*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to TRVs.

- 3.6.6 Measurable Attributes for Assessment Endpoint No. 6: Viability and Function of the Omnivorous Mammal Community

Measures of Exposure

Measured concentrations of Pb and PCBs in vegetation and clams collected from locations on-site.

Measures of Effects

Through food chain models for the raccoon (*Procyon lotor*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to TRVs.

- 3.6.7 Measurable Attributes for Assessment Endpoint No. 7: Viability and Function of the Insectivorous Bird Community

Measures of Exposure

Measured concentrations of Pb and PCBs in earthworms collected from upland areas on-site.

Measures of Effects

Through food chain models for the American robin (*Turdus migratorius*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to TRVs.

- 3.6.8 Measurable Attributes for Assessment Endpoint No. 8: Viability and Function of the Insectivorous Mammal Community

Measures of Exposure

Measured concentrations of Pb and PCBs in earthworms collected from upland areas on-site.

Measures of Effects

Through food chain models for the short-tailed shrew (*Blarina brevicauda*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to TRVs.

- 3.6.9 Measurable Attributes for Assessment Endpoint No. 9: Viability and Function of the Herbivorous Mammal Community

Measures of Exposure

Measured concentrations of Pb and PCBs in plants collected from locations on-site.

Measures of Effects

Through food chain models for the muskrat (*Ondatra zibethicus*), evaluate the toxicity of dietary exposure to Pb and PCBs on-site through comparison to TRVs.

3.7 Conceptual Model

The conceptual model uses contaminant and habitat characteristics to identify exposure pathways that will be evaluated by the selected measurement endpoints. For this risk assessment, the toxicity of contaminants in sediment and surface water will be evaluated using results from the toxicity tests, a benthic invertebrate community survey, and a fish community survey. Terrestrial and aquatic receptor species may be exposed by feeding on organisms that have accumulated contaminants in their tissues, or being directly exposed to sediment. Higher trophic level receptors may also be exposed via incidental ingestion of sediment and water. Risk to these receptors will be evaluated using food chain models. The following pathways will be evaluated in this risk assessment:

- I. Tidal flat
 - Direct contact with sediment
 - Direct contact with interstitial water
 - Direct contact with water
 - Ingestion of tidal flat biota
 - Incidental ingestion of sediment
 - Incidental ingestion of water
- II. Tidal flat used as a nursery/refuge
 - Direct contact with sediment
 - Direct contact with water
 - Ingestion of tidal flat biota
 - Incidental ingestion of sediment
 - Incidental ingestion of water
- III. Piscivorous Birds
 - Ingestion of surface water
 - Incidental ingestion of sediment
 - Ingestion of fish
- IV. Piscivorous Mammals
 - Ingestion of surface water
 - Incidental ingestion of sediment
 - Ingestion of fish
- V. Omnivorous Birds
 - Ingestion of surface water
 - Incidental ingestion of sediment
 - Ingestion of vegetation
 - Ingestion of clams
- VI. Omnivorous Mammals
 - Ingestion of surface water
 - Incidental ingestion of sediment
 - Ingestion of vegetation
 - Ingestion of clams

- VII. Insectivorous Birds
 - Ingestion of surface water
 - Incidental ingestion of soil
 - Ingestion of soil invertebrates
- VIII. Insectivorous Mammals
 - Ingestion of surface water
 - Incidental ingestion of soil
 - Ingestion of soil invertebrates
- IX. Herbivorous Mammals
 - Ingestion of surface water
 - Incidental ingestion of sediment
 - Ingestion of plants

4.0 EXPOSURE CHARACTERIZATION

The objective of the exposure assessment is to determine the pathways and media through which receptors may be exposed to site contaminants. Potential exposure pathways are dependent on habitats and receptors present on site, extent and magnitude of contamination, and environmental fate and transport of COPCs. The following discussion is limited to those organisms chosen as receptor species in the food chain exposure models.

Life history and exposure profiles for the receptor species selected for the assessment endpoints are presented in Appendix B. For each receptor, a conservative and representative exposure profile has been identified. For this risk assessment, conservative exposure parameters were used in food chain models to evaluate risk from site-related COPCs. Conservative exposure parameters include the lowest reported adult body weight and highest ingestion rates. Home range, feeding territory and breeding territory size have been reported in the literature for several species. For this ERA, an area use factor (AUF) of 1.0 was utilized, as the conservative assumption was made that the receptor species spends all of its time, and acquires all of its food from the site.

The primary food items of the receptor species (or items closely related to their primary food) were analyzed for COPCs, to estimate site-specific receptor contaminant exposure. For example, dietary composition studies indicate that the great blue heron consumes fish, reptiles, and amphibians. Forage fish were collected for analysis at the Matteo Iron and Metal site. A diet of 100% forage fish was used in the exposure profile for great blue herons. It was assumed that contaminant levels in forage fish were representative of contaminant levels in all food items consumed by great blue herons present at this site.

To be conservative, the maximum Pb and PCB concentrations measured in soil, sediment, surface water and food items collected on-site were used in the exposure models.

5.0 ECOLOGICAL EFFECTS CHARACTERIZATION

A comprehensive literature search was conducted to locate studies in which the toxicity of COPCs to wildlife receptors was evaluated. These studies were reviewed to evaluate the appropriateness of using a particular study to derive a TRV. A discussion of these studies, and the criteria used to evaluate studies are described along with the toxicity profiles in Appendix A. Two important criteria used to evaluate studies were study design and species tested. Relatively few toxicological studies have been conducted using wildlife species. Many TRVs were selected from studies in which the test organism was closely related taxonomically to a selected receptor species. It may be more appropriate to select effect levels derived from test organisms which are closely related on trophic level, and with respect to prey preferences (e.g., using an effect level for a black-crowned night heron to derive a TRV for another piscivorous species, such as the great blue heron). In all cases, an attempt was made to use consistently conservative assumptions where possible in this ERA. Conservative assumptions were used to minimize the possibility of concluding that risk is not present when risk actually does exist (i.e., the elimination of false negatives). If an acceptable study reported an effect level for a dietary exposure

route to a taxonomically related species, the lowest reported lowest observable adverse effect level (LOAEL) and the associated no observable adverse effect level (NOAEL) were selected as the TRVs.

5.1 Risk Characterization

The hazard quotient (HQ) method (Barnhouse *et al.* 1986; U.S. EPA 1997) was employed in this ERA. Briefly, the HQ method compares exposure concentrations to TRVs based on ecological endpoints such as mortality, reproductive failure, or reduced growth. This is done using chronic toxicity values derived from the literature that are intended to represent a lower dose over a longer duration of exposure, resulting in subtle effects that would be expected to manifest themselves at the population level over the long term. Both NOAEL and LOAEL values were used to determine HQs.

The comparison is expressed as a ratio of potential intake values to population effect levels, as follows:

$$\text{Hazard Quotient} = \frac{\text{Exposure Concentration (Maximum)}}{\text{Chronic Effect Level (e.g., NOAEL or LOAEL)}}$$

5.2 Methods Used to Estimate Risk

5.2.1 Use of Sediment Toxicity Tests to Evaluate Risk to Tidal Flat Function

The results of the sediment toxicity test using *Hyalella azteca* and *Chironomus tentans* were used to predict the effects of the sediment contamination adjacent to and downstream of the Matteo site with regard to the following assessment endpoint:

- Tidal Flat Community Structure and Function

The toxicity test was used to determine the potential risk to the benthic invertebrate communities from the contamination within Hessian Run and to determine if Pb and PCBs pose a risk. In addition, NOAEL and LOAEL values for each of the COPC were identified by comparing the measured levels of each contaminant in each sample to the toxicity of that sample. The resulting NOAELs and LOAELs provide a range below which the concentration of each contaminant is expected to be protective of the benthic invertebrate communities.

5.2.2 Use of Community Structure Indices to Determine Risk

In order to determine the risk to several assessment endpoints, the community structure of fish and benthic invertebrates were evaluated. Several metrics were calculated which compared the species abundance, richness, and diversity at sample locations upstream (stations 1 and 2 in Hessian Run, and 8 and 9 in Woodbury Creek), adjacent to (stations 3, 4, 5 and 6), and downstream (stations 7 and 10) of the site. These values were then compared to the reference stations (1, 2, 8 and 9) in order to determine if there was a link between contaminant levels and changes to the metrics.

This information contributed to the risk characterization for the following assessment endpoints:

- Tidal Flat Community Structure and Function
- Tidal Flat Nursery and Fish Refuge

5.2.3 Food Chain Models

This information contributed to the risk characterization for the following assessment endpoints:

- Viability of the Piscivorous Bird Community
- Viability of the Piscivorous Mammal Community
- Viability of the Omnivorous Bird Community

- Viability of the Omnivorous Mammal Community
- Viability of the Insectivorous Bird Community
- Viability of the Insectivorous Mammal Community
- Viability of the Herbivorous Mammal Community

The seven receptor species were assumed to be exposed to contaminant residues via ingestion of food, water and incidental ingestion of soil or sediment. Site-specific Pb and PCB concentrations in sediment, surface water, and tissue, in conjunction with the dietary composition of the receptor species, were used to determine the total dose to which the receptor species were exposed, per the following formula:

$$\text{Total dose} = \{ \Sigma[(\text{FIR} \times C_F) + (\text{SIR} \times C_S) + (\text{WIR} \times C_W)] \times \text{AUF} \} / \text{BW}$$

where:

FIR = Food Ingestion Rate

C_F = Contaminant Concentration in the Prey Item

SIR = Sediment/Soil Ingestion Rate

C_S = Contaminant Concentration in the Sediment/Soil

WIR = Water Ingestion Rate

C_W = Contaminant Concentration in Water

AUF = Area Use Factor

BW = Body Weight

Concentrations of PCBs in surface soils and surface water were not measured, and therefore, not included in the food chain models. The concentration of Pb was measured in surface soils and water and the concentration was used in the food chain models where appropriate.

The effect level values for each COPC were based on studies published in the literature. The exposure concentrations were estimated by employing a food chain model for each receptor species (e.g., the great blue heron) associated with an assessment endpoint (e.g., viability of the piscivorous avian community). In these food chain models, ingestion rates of each COPC for each receptor species were determined based on measured concentrations of each contaminant in water, sediment, and food items collected at the site as well as known or estimated water, sediment/soil, and food ingestion rates and body weights of each receptor species. The exposure concentrations and toxicity values were entered into the HQ equation, and a HQ was calculated. If the HQ was greater than or equal to (\geq) 1.0, based on a chronic NOAEL, it could not be concluded that there was no chronic risk from that contaminant to the ecological receptor in question. If the HQ was \geq 1.0, based on a chronic LOAEL for a particular contaminant, there was the potential to produce an actual adverse effect on survival, reproduction, or growth of the ecological receptor in question. If the HQ was \geq 1.0, based on an acute TRV, there was the potential to produce an actual adverse effect on survival of the ecological receptor in question.

Receptor species from different trophic levels were used for food chain accumulation modeling where appropriate. Organisms which are likely to be exposed to contaminants because of specific behaviors, patterns of habitat use, or feeding habits were selected for evaluation in this ERA. The availability of appropriate toxicity information on which risk calculations was based was also an important consideration. The surrogate receptor species selected for this ERA were the great blue heron, mink, wood duck, raccoon, American robin, short-tailed shrew, and muskrat.

One exposure scenario was evaluated for each receptor species using conservative life history parameters, and maximum concentrations of contaminants in food, water, and sediment. Life history parameters from published literature were used in the food chain models. Conservative life history parameters included the lowest published adult body weight and the highest published ingestion rates

for food, water, and incidental sediment.

The results of these models were used to determine the contamination values that bound the threshold for adverse effects to each assessment endpoint (U.S. EPA 1997) and can be used as one line of evidence for evaluating site management alternatives.

Sediment concentrations were entered into the models as dry weights, and food item concentrations were entered into the models as wet weights to be compared to the TRVs derived from the literature. The supporting data were not available to convert sediment to wet weight or food items to dry weight (see Section 8.0). In addition, the water concentrations entered into the models were for unfiltered water because this represented a more realistic exposure via ingestion of water than the use of filtered water.

This ERA utilized simplifying assumptions in the food chain models, since it is difficult to mimic a complete diet. According to food chain dynamics, maximum stability results when a large number of species eat a restricted diet, or when a smaller number of species eats a wide variety of other species. The seasonal availability of prey also results in a prey specialization by the consumer. Given these factors and the conservative approach used in the food chain models, piscivorous and herbivorous receptor species were assumed to only consume a single food item at the Matteo Iron and Metal site. It was assumed that COPC concentrations in the food items collected were representative of the COPC concentrations in all food items potentially consumed by that receptor.

The first part of the discussion examines the generated exposure and effects data and integrates these observations into concise statements that identify risks to the assessment endpoints. This discussion is followed by a summary that documents the environmental contamination levels that exceed the threshold for adverse effects to the assessment endpoints (U.S. EPA 1997). The boundary for the adverse effects threshold was the NOAEL-based HQ value. The following assumptions were made:

- If the NOAEL-based HQ was ≥ 1.0 but the LOAEL-based HQ was not, it was concluded that it could not be determined that there was no model calculated risk.
- A contaminant concentration was considered to exceed the threshold and demonstrate model calculated risk to the given receptor if both the NOAEL-based HQ and LOAEL-based HQ were ≥ 1.0 .
- If neither the NOAEL- or LOAEL-based HQs were ≥ 1.0 , it was concluded that there is no model calculated risk to the given receptor.

5.2.4 Treatment of Data

There were several instances when specific PCB Aroclors were not detected in sediment or food items. In order to calculate a total Aroclor concentration for use in the food chain accumulation models, only those Aroclors that were detected were included in the calculation. This includes those values that were flagged with a "J" data qualifier (as an estimated concentration). Those Aroclors that were flagged with a "U" data qualifier (not detected) were not used in the calculation of a total Aroclor concentration.

6.0 BIOTA STUDY RESULTS

All site-specific data utilized in this ERA were collected during the Aquatic Biota Study conducted during the RI in 2003 (Berger 2004b). A summary of the biota samples that were collected during this study is in Table 1. No additional data were collected.

6.1 Surface Water Analytical Results

Surface water was collected from all 10 sample locations at high tide within the approximate quarter channel nearest the site. Surface water samples were analyzed for Pb, total hardness, and pH. Results are listed in Table 2. For this risk assessment, only the results from the total Pb analysis were used in the food chain models. However, data is available for Pb in filtered water samples (Table 2; Berger 2004a). During this survey salinity was recorded at below 0.11 ppt. Lead concentrations in surface water ranged from below the detection limit (1.3 micrograms per liter [ug/L]) to 19.5 ug/L.

6.2 Sediment Analytical Results

Surface sediment (0-6" depth) was collected from seven locations in Hessian Run (Stations 1 - 7) and three locations in Woodbury Creek (Stations 8 - 10). Samples were collected from the mid-tide level at each station at low tide. The concentrations of Pb and PCBs are recorded in this risk assessment (Table 3) however, additional data (pH and total organic carbon) are available in Berger (2004a). Sediment Pb concentrations ranged from 70 to 19,600 mg/kg, and total PCB concentrations in sediment ranged from below the detection limit (0.03 mg/kg) to 35 mg/kg.

6.3 Sediment Toxicity Test Results

Two gallons of surface sediment were collected at all 10 aquatic sample locations in the study area and submitted for toxicity testing. Samples were collected at the same time and stations as the samples collected for sediment chemistry analysis.

6.3.1 Acute Toxicity Tests Conducted with *Hyallela azteca*

Twenty-eight day solid phase toxicity tests were conducted on samples from all ten stations from the study area and one control sediment of known quality (from Spruce Run Reservoir in Hunterdon County, NJ). Endpoints measured were mortality (mean survival) and growth (mean dry weight).

The percent (%) survival of amphipods from Stations 1, 2, 3, 5, and 8 were not significantly different than the control location. There was 100 % mortality in the sample collected from Station 4. Amphipods exposed to samples from Stations 6, 7, 9, and 10 had significantly lower survival compared to those exposed to the control sediment (Table 4).

Growth was not evaluated for stations where survival was impacted (Stations 4, 6, 7, 9 and 10). Average dry weight was significantly less in amphipods exposed to sediment collected at Station 8 than for amphipods exposed to the control sediment. No effects on growth were observed in amphipods exposed to sediment collected from Stations 1, 2, 3 and 5 (Table 4).

6.3.2 Acute Toxicity Tests Conducted with *Chironomus tentans*

Twenty-day solid phase toxicity tests were conducted on samples from all ten stations from the study area and one control sediment of known quality (from Spruce Run Reservoir in Hunterdon County, NJ). Endpoints measured were mortality (mean survival) and growth (mean dry weight).

The % survival of chironomids from Stations 8 and 9 was not significantly different than the control location. There was 100 % mortality observed in sample collected from Station 4. Chironomids exposed to samples from Stations 1, 2, 3, 5, 6, 7, and 10 had significantly lower survival compared to those exposed to the control treatment (Table 4).

Growth was not evaluated for stations where survival was impacted (Stations 1, 2, 3, 4, 5, 6, 7, and 10). No effects on growth were observed in chironomids exposed to sediment collected from Stations 8 and

9 (Table 4).

It should be noted that the recommended minimum control survival for chironomids in a 20-day exposure is 70%, and observed control survival was 66.7%. The reduced control survival may have been due to handling procedures during placement of test organisms in test chambers. Technically, this invalidates the results of the toxicity tests, and therefore, for the purposes of this risk assessment, more reliance will be placed on the results of the *H. azteca* toxicity tests. However, survival rates for site samples were markedly lower than the controls.

It should also be noted that a 65-day chironomid growth and emergence test was also conducted on site sediment. The results and conclusions of this test is described in detail in the Aquatic Biota Study Report (Berger 2004b) and are not described within this risk assessment.

6.4 Fish Community Survey Results

Fish samples were collected at seven stations in Hessian Run and three stations in Woodbury Creek using a seine (0.25-inch mesh). Three replicate hauls were made within two hours of low tide in the opposite direction of the prevailing tidal current. Fish were identified in the field, and 25 individuals of each species were measured per replicate sample, if available.

Although fish community data summaries were presented in the Aquatic Biota Study Report (Berger 2004b), the summary calculations presented for stations adjacent to the site and reference locations could not be reproduced using the data presented in Table 13, Berger (2004b) and the statistical summary sheet in the Appendix. In addition, the report included results from Stations 7 and 10 in the "reference stations" summary. These stations are downstream of the site, and should not be considered reference locations. For this ERA, the data presented for the individual stations was utilized to calculate the mean number of species and mean diversity values presented in Table 5; these values differ from the values in Berger (2004b).

Table 5 presents abundance, richness, and species diversity of the fish community at each of the ten sample stations. Species richness and diversity were low at sample Stations 3, 4, 5 and 6 (adjacent to the Site). Only four fish species were caught at sample stations adjacent to the site, while eleven species were captured at the reference stations. The mean diversity at the four stations adjacent to the site (Stations 3,4,5, and 6) as measured by the Shannon-Weaver Diversity Index was 0.282 as compared to a diversity index of 0.326 at the reference stations. Two species, banded killifish (*Fundulus diaphanus*) and mummichog (*F. heteroclitus*) comprised most of the fish captured at stations adjacent to the site.

The fish communities in Hessian Run consisted almost entirely of omnivorous species (99% to 100%). Omnivores were also dominant in Woodbury Creek (76% to 93% of individuals captured), but other trophic levels were also present.

6.5 Benthic Macroinvertebrate Community Survey

Samples for benthic macroinvertebrate community analysis were collected at seven stations in Hessian Run and three stations in Woodbury Creek. The substrate in the study area is predominantly silt with underlying clay. Benthic cores were collected by inserting a 100 millimeter (mm) by 100 mm hand-held square core 100 mm into the substrate at water's edge at low tide. Three replicate samples were collected at each sample station. Samples were sorted in the field and identified to the lowest practicable taxon in the laboratory. Table 6 presents species abundance, richness, and diversity at each of the ten sample stations.

Although benthic community data summaries were presented in the Aquatic Biota Study Report (Berger 2004b), the summary calculations presented for stations adjacent to the site and reference locations could not be reproduced using the data presented in Table 13, Berger (2004b) and the statistical summary sheet in the Appendix. In addition, the report included results from Stations 7 and 10 in the "reference stations" summary.

These stations are downstream of the site, and should not be considered reference locations. For this ERA, the data presented for the individual stations was utilized to calculate the mean number of species and mean diversity values presented in Table 6; these values differ from the values in Berger (2004b).

Macroinvertebrate diversity in Hessian Run and Woodbury Creek was low, with oligochaetes, chironomids and the Asian clam comprising over 97% of the individuals collected. Diversity in samples collected at stations adjacent to the site (Stations 3,4,5 and 6) was lower (0.353) than diversity at reference stations (0.404).

The macroinvertebrate communities at stations adjacent to the site were comprised almost exclusively of deposit feeders (95%), with few filter feeders (4%) or carnivores (less than 1%). Deposit feeders also dominated macroinvertebrate communities at the reference stations (83%), but greater numbers of filter feeders (16%) were present.

The macroinvertebrate community present at Stations 3, 4, 5 and 6 was comprised entirely of pollution tolerant organisms. Communities at the reference stations were comprised primarily of tolerant taxa (96.5%), but some moderately tolerant taxa were present (3.3%) and a single sensitive individual was collected.

6.6 Fish Tissue Results

Banded killifish were collected for tissue analysis (whole body) from three stations in Hessian Run adjacent to the site (Stations 3, 4 and 5) and three stations in Woodbury Creek (Stations 8, 9 and 10). Three replicate samples were collected at each station. Pumpkinseed (*Lepomis gibbosus*) were collected for assessment of human health risk. However, due to the small size of individuals collected, whole-body analysis was also done for this species. Banded killifish are omnivorous, while pumpkinseed are water column feeders. Concentrations of Pb and PCBs were measured in fish tissue (Tables 7 and 8).

Only Aroclors 1248, 1254, and 1260 were detected in the killifish samples. The concentration of total Aroclors ranged from 0.236 to 0.674 mg/kg wet weight. Generally, the concentration of total Aroclors increased in a downstream direction in both the fish collected from Hessian Run (Stations 3,4, and 5) as well as for the fish collected from Woodbury Creek (Stations 8,9, and 10).

The concentration of Pb in killifish ranged from 0.37 to 1.6 mg/kg wet weight. The highest concentration of Pb was detected in killifish collected from Station 3 and the lowest concentration of Pb was detected in killifish collected from Station 10.

Pumpkinseed were only collected from 2 stations. The concentration of total Aroclors for the fish collected from Station 4 (Hessian Run) ranged from 0.277 to 0.66 mg/kg, wet weight. The concentration of total Aroclors in fish collected from Station 9 (Woodbury Creek) ranged from 0.227 to 0.482 mg/kg, wet weight. The concentration of Pb in pumpkinseed collected from Hessian Run ranged from 0.47 to 0.6 mg/kg, wet weight. The concentration of Pb in pumpkinseed collected from Woodbury Creek ranged from 0.17J (estimated concentration) to 0.61 mg/kg, wet weight.

6.7 Benthic Macroinvertebrate Tissue Results

Asian clams (*Corbicula fluminea*) were collected for tissue analysis from three stations in Hessian Run adjacent to the site (Stations 3, 4 and 5) and three stations in Woodbury Creek (Stations 8, 9 and 10). Three replicate samples were collected at each station; 250 clams were collected per sample.

The concentration of total Aroclors in Asian clams ranged from 0.146 to 0.396 mg/kg, wet weight. The concentration of Pb in Asian clams ranged from 0.38 to 1.3 mg/kg, wet weight.

While Asian clams are residents, they feed on plankton transported by the tides. Therefore, the tissue concentrations of Pb and PCBs may not reflect the sediment concentration of contaminants in the immediate

station as strongly as a tissue concentrations in a deposit feeding invertebrate species would (Berger 2004b).

6.8 Wetland Plant Tissue Results

Spatterdock (*Nuphar luteum*) and wild rice (*Zizania aquatica*) were collected for tissue analysis. Plants were collected from three stations in Hessian Run adjacent to the site (Stations 3, 4 and 5) and one station in Woodbury Creek (Station 8). For both species, only above-ground parts of the plant were collected. Only vegetation parts free of sediment were collected. Spatterdock samples consisted of stems and leaves, while wild rice samples were comprised of stems, leaves and seed heads. Concentrations of Pb and PCBs measured in plant tissue are presented in Tables 10 and 11.

For spatterdock, only Aroclors 1254 and 1260 were detected in the samples (except for Aroclor 1248 in one replicate sample collected from Station 8). The concentration of total Aroclors ranged from below the detection limit (0.005 mg/kg) to 0.027 mg/kg, wet weight. The concentration of Pb in spatterdock ranged from 1.4 to 9.8 mg/kg, wet weight.

For wild rice, only Aroclors 1254 and 1260 were detected in the samples. The concentration of total Aroclors ranged from below the detection limit (0.005 mg/kg) to 0.0214 mg/kg, wet weight. The concentration of Pb in wild rice ranged from 0.23J mg/kg (estimated concentration) to 8.2 mg/kg, wet weight.

6.9 Soil Invertebrate Tissue Results

Earthworm (*Lumbricus spp.*) samples were collected from three upland areas on-site and one off-site reference station. Three replicate samples were collected at each station using shovels. After collection, earthworms were rinsed with distilled water to remove associated soil particles. Worms were not dissected or depurated prior to analysis. In the laboratory, whole earthworms were homogenized and analyzed for Pb and PCBs. Collocated soil samples were not collected. Lead and PCB concentrations measured in earthworms are presented in Table 12.

The concentration of total Aroclors detected in earthworm ranged from 0.012 (reference area) to 9.1 mg/kg, wet weight. The concentration of Pb detected in earthworm ranged from 4.5 (reference area) to 1,150 mg/kg, wet weight.

7.0 RESULTS OF THE HAZARD EVALUATION

Below is a discussion of the risk posed to each of the assessment endpoints. The discussion includes a comparison of sediment and water concentrations to benchmark values, the results of benthic macroinvertebrate and finfish surveys, and food chain models utilizing site-specific tissue concentrations. A summary of all food chain exposure model results is presented in Table 13.

7.1 Assessment Endpoint No. 1: Tidal Flat Community Structure and Function

The concentration of Pb in surface water exceeded the NJDEP chronic criteria at 6 stations (Stations 2, 3, 5, 6, 8 and 10). The concentration of Pb at Station 9 was below the detection limit of 2.8 ug/L and the chronic criterion for this location is 2.7 ug/L. Therefore, it could not be determined if the concentration of Pb at this station exceeded the criterion. The concentration of Pb in the surface water did not exceed the NJDEP acute criterion at any of the stations.

The concentration of Pb in sediment exceeded the SEL at 3 sample stations adjacent to the site (3, 4, and 6) and exceeded the LEL at all sample stations.

The concentration of PCBs in sediment do not exceed the SEL (SELs are only available for Aroclors 1016, 1248, 1254, and 1260) at any sample station. The concentration of Aroclor 1248 exceeded the LEL at sample

Stations 7 and 9. The detection limit for Aroclor 1248 was higher than the LEL at Stations 1, 2, 3, 4, 5, 6, and 8, therefore, it could not be determined conclusively if the concentration of Aroclor 1248 exceeded the LEL or not. The detection limit for Aroclor 1248 at Station 10 was equal to the LEL, and therefore, this sample did not exceed the LEL.

The concentration of Aroclor 1260 exceeded the LEL at all stations except Stations 8 and 10. However, the detection limit for Aroclor 1260 at Stations 8 and 10 was higher than the LEL, therefore, it could not be determined conclusively if the concentration of Aroclor 1260 at these stations exceeded the LEL or not.

One hundred % mortality was observed in *H. azteca* exposed to sediment collected from Station 4. Station 4 had the highest concentration of total Aroclors (35 mg/kg, dry weight) of any sediment sample collected during the biota study (Berger 2004b) however, it did not have the highest Pb concentration. For the *H. azteca* test, there was also significant mortality observed in samples collected from Stations 6, 7, 9, and 10. These results do not appear to correlate with Pb or PCB concentrations. There may be several explanations for this response. Often when a large volume of sediment is collected for toxicity testing, incomplete homogenization of the sample will result in chemical concentrations that do not correlate with the observed toxicity. In addition, Pb and PCBs were the only chemical parameters measured in these samples. However, the toxic response may also be the result of the sediment type, other contaminants in the sediment, or other water quality issues.

Given the poor survival in the control sample of the *C. tentans* test, it is difficult to assess the toxic response. However, there was acute toxicity in samples collected from Stations 1,2,3,4,5,6,7, and 10.

The mortality observed in the sediment bioassays did not correlate with measured concentrations of either Pb or PCBs. Lead and PCB concentrations in surface water and sediment were lower at Station 10 than at other locations, however significant mortality was observed in samples from this location in both bioassays. Based on the bioassay results, it was not possible to identify a sediment concentration protective of the benthic community.

The benthic community diversity was lower at stations adjacent to the site (Stations 3, 4, 5, and 6), and the species found at these stations were all pollution tolerant.

7.2 Assessment Endpoint No. 2: Tidal Flat Nursery and Refuge Functioning

Fish diversity at Stations 3, 4, 5, and 6 (adjacent to the site) was slightly lower than the diversity in the samples collected at the reference stations.

7.3 Assessment Endpoint No. 3: Viability and Function of the Piscivorous Bird Community

Dietary exposure concentrations for the piscivorous bird community were modeled using the great blue heron and bald eagle as surrogate receptor species.

Based on the food chain model with the great blue heron as the receptor species, it could not be concluded there was no model-calculated risk to the piscivorous bird community from Pb at this site, as the calculated NOAEL-based HQ exceeded 1.0 (Table 14). It also could not be concluded there was no model-calculated risk to the piscivorous bird community from PCBs at this site, as the calculated NOAEL-based HQ exceeded 1.0.

Based on the food chain model with the bald eagle as the receptor species, it could not be concluded there was no model-calculated risk to the piscivorous bird community from Pb at this site, as the calculated NOAEL-based HQ exceeded 1.0 (Table 14). It also could not be concluded there was no model-calculated risk to the piscivorous bird community from PCBs at this site, as the calculated NOAEL-based HQ exceeded 1.0.

7.4 Assessment Endpoint No. 4: Viability and Function of the Piscivorous Mammal Community

Dietary exposure concentrations for the piscivorous mammal community were modeled using the mink as a surrogate receptor species. It could not be concluded there was no model-calculated risk to the piscivorous mammal community from Pb at this site, as the calculated NOAEL-based HQ exceeded 1.0 (Table 14).

There was model-calculated risk to the piscivorous mammal community from PCBs at this site, with calculated NOAEL- and LOAEL-based HQs greater than 1.0.

7.5 Assessment Endpoint No. 5: Viability and Function of the Omnivorous Bird Community

Dietary exposure concentrations for the omnivorous bird community were modeled using the wood duck as a surrogate receptor species. There was model-calculated risk to the omnivorous bird community from Pb at this site, with calculated NOAEL- and LOAEL-based HQs significantly greater than 1.0 (Table 15).

It could not be concluded there was no model-calculated risk to the omnivorous bird community from PCBs at this site, as the calculated NOAEL-based HQ exceeded 1.0.

7.6 Assessment Endpoint No. 6: Viability and Function of the Omnivorous Mammal Community

Dietary exposure concentrations for the omnivorous mammal community were modeled using the raccoon as a surrogate receptor species. There was model-calculated risk to the omnivorous mammal community from Pb at this site, with calculated NOAEL- and LOAEL-based HQs greater than 1.0 (Table 15).

There was also model-calculated risk to the omnivorous mammal community from PCBs at this site, with calculated NOAEL- and LOAEL-based HQs greater than 1.0.

7.7 Assessment Endpoint No. 7: Viability and Function of the Insectivorous Bird Community

Dietary exposure concentrations for the insectivorous bird community were modeled using the American robin as a surrogate receptor species. There was model-calculated risk to the insectivorous bird community from Pb at this site, with calculated NOAEL- and LOAEL-based HQs significantly greater than 1.0 (Table 16).

It could not be concluded there was no model-calculated risk to the insectivorous bird community from PCBs at this site, as the calculated NOAEL-based HQ exceeded 1.0.

Food chain models were also evaluated using an acute TRV for this assessment endpoint (Table 17). There was an acute model-calculated risk to the insectivorous bird community from Pb at this site, with a calculated acute TRV-based HQ of 3.0. Using an acute TRV, there was no model-calculated risk to the insectivorous bird community from PCBs at this site.

7.8 Assessment Endpoint No. 8: Viability and Function of the Insectivorous Mammal Community

Dietary exposure concentrations for the insectivorous mammal community were modeled using the short-tailed shrew as a surrogate receptor species. There was model-calculated risk to the insectivorous mammal community from Pb at this site, with calculated NOAEL- and LOAEL-based HQs significantly greater than 1.0 (Table 16).

There was model-calculated risk to the insectivorous mammal community from PCBs at this site, with calculated NOAEL- and LOAEL-based HQs significantly greater than 1.0.

Food chain models were also evaluated using an acute TRV for this assessment endpoint (Table 17). There was an acute model-calculated risk to the insectivorous mammal community from Pb at this site, with a calculated

acute TRV-based HQ of 7.7. Using an acute TRV, there was no model-calculated risk to the insectivorous mammal community from PCBs at this site.

7.9 Assessment Endpoint No. 9: Viability and Function of the Herbivorous Mammal Community

Dietary exposure concentrations for the herbivorous mammal community were modeled using the muskrat as a surrogate receptor species. There was model-calculated risk to the herbivorous mammal community from Pb at this site, with calculated NOAEL- and LOAEL-based HQs greater than 1.0 (Table 14).

There was also model calculated risk to the herbivorous mammal community from PCBs at this site, with calculated NOAEL- and LOAEL-based HQs greater than 1.0.

8.0 SOURCES OF UNCERTAINTY

This ERA evaluates exposure to contaminants through direct contact with water, soil and sediment; ingestion of food and water; and incidental soil or sediment ingestion. There are factors inherent in the risk assessment process which contribute to uncertainty and need to be considered when interpreting results. Major sources of uncertainty include natural variability, error, and insufficient knowledge. Natural variability is an inherent characteristic of ecological receptors, their stressors, and their combined behavior in the environment. Biotic and abiotic parameters in these systems may vary to such a degree that the exposure of similar ecological receptors within the same system may differ temporally and spatially. Factors that contribute to temporal and spatial variability may be differences in individual organism behavior (within a species), changes in the weather or ambient temperature, unanticipated interference from other stressors, differences between microenvironments, and numerous other factors.

In general, data were shown to two decimal places. However, values obtained from the literature were used as reported in the citation. Where means were calculated, the calculated value was retained. In the food chain models, the full value of calculations were retained. This was done to minimize rounding errors which may have added uncertainty, and does not imply additional precision. Hazard quotient calculations were shown to two decimal places, except where additional figures were needed to determine if the result was ≥ 1.0 .

The data set used for food chain exposure modeling added some uncertainty to the calculation of risk. All sediment/soil analytical data was provided as mg/kg dry weight, while all tissue (plant or invertebrate) analytical data was provided as mg/kg wet weight. Since no supporting data (% solids and/or % moisture) was supplied to convert from dry weight to wet weight (or *vice versa*), the data were used as published. However, the uncertainty was minimized because the difference in COPC concentrations between the sediment/soil and tissue were several orders of magnitude. The sediment/soil was the risk driver, the tissue data did not contribute significantly to the overall calculated risk.

A major source of uncertainty arises from the use of toxicity values reported in the literature which are derived from single-species, single-contaminant laboratory studies. Prediction of ecosystem effects from laboratory studies is difficult. Laboratory studies cannot take into account the effects of environmental factors which may add to the effects of contaminant stress. NOAELs were generally selected from studies using single contaminant exposure scenarios. Species utilizing the Matteo Iron and Metal Site are exposed to a variety of contaminants.

In cases where a toxicity value has been converted by a factor of 10, the uncertainty associated with the absence of a directly relevant literature value was compounded by the uncertainty associated with a subjective mathematical adjustment.

Point estimates of exposure such as NOAELs, LOAELs, Lethal Dose to half of the exposed organisms (LD_{50} s), and mathematical means that are presented in the literature also have inherent variability, which is incorporated into the risk assessment. Additionally, because these values are statistically determined, they do not represent absolute thresholds; they are reflective of the experimental design. A reported LOAEL may not represent the lowest toxicity threshold for a species simply because lower concentrations were not tested in a study.

In addition, uncertainty associated with variability is introduced from the use of literature values for sediment, water, and food ingestion rates, dietary compositions, and body weights. These values reported in the literature are from studies that may have been conducted at a time of year or in a location that does not necessarily give an accurate representation of the life histories of the receptor species in the Matteo Iron area.

There is very little information available in the literature regarding the rates of incidental sediment ingestion for wildlife species. In this risk assessment some of these values were calculated from an allometric equation. Additional uncertainty regarding incidental soil/sediment ingestion is introduced by simplifying the diet in the food chain models. In reality, each receptor organism's diet is varied, and therefore, the associated soil/sediment intake fluctuates as different prey items are selected over time.

This ERA did not examine the contribution of dermal absorption or inhalation exposure as part of the exposure pathway. In contrast to the use of conservative assumptions, the error introduced into this risk assessment by the omission of these routes of exposure may be on the side of a less protective outcome. The relative degree to which this error alters the outcome of the risk assessment is unknown.

Error can be introduced by use of invalid assumptions in the conceptual model. Conservative assumptions were made in light of the uncertainty associated with the risk assessment process. This was done to minimize the possibility of concluding that no risk is present when a threat actually does exist (i.e., elimination of false negatives). Whenever possible, risk calculations were based on conservative values. For example, LOAELs used to calculate HQs were the lowest values found in the literature, regardless of toxic mechanism.

9.0 CONCLUSIONS OF THE RISK ASSESSMENT

Sediment and water samples were collected from 10 stations upstream, adjacent to, and downstream of the site. Samples were collected from both Hessian Run and Woodbury Creek. The results of these analyses were compared to toxicity BM to determine the risk to biota. Toxicity tests were also used to determine the impact of exposure to site sediment on biota. Community structure surveys were conducted on the indigenous benthic macroinvertebrate and fish communities to evaluate risk. Lastly, food chain models were used to determine the risk from the trophic transfer of contaminants in the food chain to upper trophic level species. The conclusions of the risk assessment are listed below:

- Lead concentrations measured in water samples were compared to both acute and chronic NJDEP SWQS. The concentration of Pb in surface water exceed these the chronic criteria at 6 stations (Stations 2, 3, 5, 6, 8 and 10). The concentration of Pb at Station 9 was not detected at a detection limit of 2.8 ug/L. The chronic criterion for this location is 2.7 ug/L, therefore, it could not be determined if the concentration of Pb at this station exceeded the criterion. The concentration of Pb in the surface water did not exceed the acute criteria at any of the stations.
- Lead concentrations in sediment samples exceed the SEL at stations adjacent to the site (Stations 3, 4, and 6), and exceed the LEL at all stations sampled.
- The concentration of PCBs in sediment does not exceed the SEL at any station. The concentration of Aroclor 1248 exceeded the LEL at sample Stations 7 and 9. However, the detection limit was higher than the LEL at Stations 1, 2, 3, 4, 5, 6, and 8, therefore, it could not be determined if the concentration of Aroclor 1248 exceeded the LEL or not. The detection limit for Aroclor 1248 at Station 10 was equal to the LEL, and therefore, this sample did not exceed the LEL. The concentration of Aroclor 1260 exceeded the LEL at all stations except Stations 8 and 10. However, the detection limit for Aroclor 1260 at Stations 8 and 10 was higher than the LEL. Therefore, it could not be determined conclusively if the actual concentration of Aroclor 1260 at Stations 8 and 10 exceeded the LEL or not.
- Sediment toxicity tests indicate that the sample collected at Station 4, adjacent to the site, was 100% toxic to *H. azteca* and *C. tentans*. The indigenous benthic macroinvertebrate community was less diverse at stations adjacent to the site (Stations 3, 4 and 6) than the reference stations. In addition, the benthic assemblage at

stations 3, 4, 5 and 6 was entirely comprised of pollution tolerant species, while moderately tolerant or sensitive species were present at some reference locations.

- The fish community survey indicates that species richness and diversity was lower at stations adjacent to the site (Stations 3, 4, 5 and 6) than at all reference stations except Stations 1 and 2.
- Food chain model calculations indicate that insectivorous birds, insectivorous mammals, omnivorous birds, omnivorous mammals, and herbivorous mammals are at risk from the ingestion of Pb (LOAEL-based HQs greater than 1.0).
- Food chain model calculations indicate that insectivorous mammals, herbivorous mammals, omnivorous mammals and piscivorous mammals are at risk from the ingestion of PCBs (LOAEL-based HQs greater than 1.0).
- The food chain models also indicate that insectivorous birds and insectivorous mammal are at risk of acute toxicity from the ingestion of Pb.
- Based on food chain model calculations, it cannot be concluded that piscivorous mammals and piscivorous birds are not at risk from ingestion of Pb (NOAEL-based HQ greater than 1.0, LOAEL-based HQ less than 1.0).
- Based on food chain model calculations, it cannot be concluded that piscivorous birds, omnivorous birds, and insectivorous birds are not at risk from ingestion of PCBs (NOAEL-based HQ greater than 1.0, LOAEL-based HQ less than 1.0).
- For the food chain models, soil (and sediment) drive the risk to the mammals (except for PCBs to piscivorous mammals and Pb and PCBs to insectivorous mammals).

The risk assessment conclusions demonstrate the link between site contaminants and environmental impacts in the aquatic and terrestrial ecosystem. In addition, this ecological risk assessment indicates that the wildlife which utilize the area of highest site-related contamination as a foraging area are at risk.

10.0 LITERATURE CITED

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Tables

Table 1. Biota Study Sample Locations
Matteo Iron and Metal Site
West Deptford, NJ
July 2005

Station	Water Chemistry	Sediment Chemistry	Sediment Toxicity Tests			Fish Community Structure	Benthic Community Structure	Invertebrate <i>Corbicula fluminea</i> Asiatic clam	Fish Tissue		Plant Tissue		Invertebrate
			<i>Hyalella azteca</i> 28-d amphipod	<i>Chironomus tentans</i> 20-d midge	<i>Chironomus tentans</i> 65-d midge (emergence)				<i>Lepomis gibbosus</i> Pumpkinseed	<i>Fundulus diaphanus</i> Banded killifish	<i>Nuphar luteum</i> Spatterdock	<i>Zizania aquatica</i> Wild Rice	
1*	X	X	X	X	X	X	X						
2*	X	X	X	X	X	X	X						
3	X	X	X	X	X	X	X	X		X			
4	X	X	X	X	X	X	X	X	X				
5	X	X	X	X	X	X	X	X	X		X	X	
6	X	X	X	X	X	X	X			X	X	X	
7*	X	X	X	X	X	X	X				X	X	
8*	X	X	X	X	X	X	X	X		X	X	X	
9*	X	X	X	X	X	X	X	X			X	X	
10*	X	X	X	X	X	X	X	X	X		X	X	
4E								X		X	X	X	
4.5E													X
5E													X
8E*													X

* Indicates a reference location

Table 2. Concentration of Lead in Surface Water Samples
Matteo Iron and Metal Site
West Deptford, NJ
July 2005

Station	pH	Hardness mg/L	Lead ug/L	Acute Criteria ¹ ug/L	Chronic Criteria ¹ ug/L
1	7.2	228	1.3U	156.4	6.1
2	7.2	176	5.6	118.8	4.6
3	7.3	160	8.9	107.3	4.2
4	7.2	228	4.0	156.4	6.1
5	7.3	100	5.9	64.6	2.5
6	7.3	132	19.5	87.3	3.4
7	7.2	136	3.4	90.1	3.5
8	7.2	116	3.2	75.9	3
9	7.3	108	2.8U	70.2	2.7
10	7.2	76	5.0	47.8	1.9

U = Not detected above the sample quantitation limit

Results are for non-filtered water samples and do not include duplicate analyses

1 - Acute and chronic criteria are corrected for hardness

pH measured in standard units

mg/L = milligrams per liter

ug/L = micrograms per liter

Table 3. Concentrations of Lead and PCBs in Sediment

Matteo Iron and Metal Site

West Deptford, NJ

July 2005

Station	Lead mg/kg	Aroclor 1016 mg/kg	Aroclor 1221 mg/kg	Aroclor 1232 mg/kg	Aroclor 1242 mg/kg	Aroclor 1248 mg/kg	Aroclor 1254 mg/kg	Aroclor 1260 mg/kg	Total Aroclors ¹
1	217	0.05U	0.05U	0.05U	0.05U	0.05U	0.15J	0.15	0.3
2	175	0.04U	0.04U	0.04U	0.04U	0.04U	0.2	0.14	0.34
3	19600	0.11U	0.11U	0.11U	0.11U	0.11U	0.39	0.23	0.62
4	2200	1.4U	1.4U	1.4U	7J	1.4U	10	18	35
5	248	0.10U	0.10U	0.10U	0.10U	0.10U	1.2	0.44	1.64
6	349	0.083U	0.083U	0.083U	0.083U	0.083U	0.3	0.11	0.41
7	168	0.071U	0.071U	0.071U	0.071U	0.19J	0.66J	0.38	1.23
8	70	0.032U	0.032U	0.032U	0.032U	0.032U	0.032U	0.032U	0.032U
9	96.1	0.052U	0.052U	0.052U	0.052U	0.077	0.16J	0.089J	0.326
10	88	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U
Lowest Effect Level	31	0.007	NA	NA	NA	0.03	0.06	0.005	
Severe Effect Level	250	53	NA	NA	NA	150	34	24	

U - Not detected at the sample quantitation limit

J - estimated concentration

¹ - Total Aroclors is the sum of all Aroclors detected above the sample quantitation limit

mg/kg = milligrams per kilogram

Results reported as dry weight

**Table 4. Percent Survival and Dry Weight
in 28-Day *H. azteca* and 20-Day *C. tentans* Toxicity Test
Matteo Iron and Metal Site
West Deptford, NJ
July 2005**

Station	<i>Hyaella azteca</i>		<i>Chironomus tentans</i>	
	Mean	Mean	Mean	Mean
	Survival %	Dry Weight mg	Survival %	Dry Weight mg
Control	98	0.076	66.7	0.645
1	96	0.093	26.7*	NA
2	94	0.081	25*	NA
3	84	0.073	5*	NA
4	0*	NA	0*	NA
5	92	0.075	25*	NA
6	70*	NA	33.3*	NA
7	56*	NA	16.7*	NA
8	92	0.057*	70	0.593
9	76*	NA	41.7	0.945
10	68*	NA	23.3*	NA

NA - not analyzed due to excessive mortality

* indicates statistically different than the control

% = percent

mg = milligrams

Table 5. Fish Species Abundance, Richness, and Diversity
Matteo Iron and Metal Site
West Deptford, NJ
July 2005

Species Name	Common Name	Station										On-site Stations (3,4,5,6)	Reference (1,2,8,9)	All other locations (1,2,7,8,9,10)
		1	2	3	4	5	6	7	8	9	10			
<i>Fundulus diaphanus</i>	Banded killifish	14	3	15	306	67	50	22	370	384	61			
<i>Fundulus heteroclitus</i>	Mummichog	8	6	12	708	224	26	16	2	15	4			
<i>Etheostoma olmstedii</i>	Tessellated darter	1						3	10	1	5			
<i>Hybognathis regius</i>	Eastern silvery minnow	1	1						2	38	42			
<i>Alosa pseudoharengus</i>	Alewife				2			3	39	4	13			
<i>Lepomis gibbosus</i>	Pumpkinseed		1		7	1		1	2	5	1			
<i>Anguilla rostrata</i>	American eel								3	2				
<i>Anchoa sp.</i>	Anchovy								2	1				
<i>Menidia menidia</i>	Silverside										1			
<i>Morone americana</i>	White perch		1					1	44	19	14			
<i>Morone saxatilis</i>	Striped bass								4		2			
<i>Trinectes maculatus</i>	Hogchoker							1	3					
	Total	24	12	27	1023	292	76	47	481	469	143	1418	986	1176
	Species Richness	4	5	2	4	3	2	7	11	9	9	2.5	5	5
	Shannon-Weaver Diversity Index	0.334	0.275	0.298	0.288	0.26	0.279	0.51	0.39	0.306	0.586	0.282	0.326	0.4

Table 7. Concentrations of Lead and PCBs in *Fundulus diaphanus*

Matteo Iron and Metal Site

West Deptford, NJ

July 2005

Station	Sample ID	Lead (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)	Total Aroclors (mg/kg)
3	3F1	1.5	0.015U	0.015U	0.015U	0.015U	0.036	0.19	0.067	0.293
	3F2	1.6	0.015U	0.015U	0.015U	0.015U	0.032	0.17	0.061	0.263
	3F3	1.6	0.025U	0.025U	0.025U	0.025U	0.043J	0.25	0.087	0.337
4	4F1F	0.78	0.05U	0.05U	0.05U	0.05U	0.1J	0.38J	0.13	0.61
	4F2F	0.78	0.025U	0.025U	0.025U	0.025U	0.068J	0.3J	0.16	0.528
	4F3F	0.7	0.025U	0.025U	0.025U	0.025U	0.056	0.24J	0.11J	0.406
5	5F1F	0.99	0.05U	0.05U	0.05U	0.05U	0.074	0.44J	0.16	0.674
	5F2F	1.2	0.05U	0.05U	0.05U	0.05U	0.069	0.39	0.16	0.619
	5F3F	0.82	0.025U	0.025U	0.025U	0.025U	0.09	0.26	0.075	0.425
8	8F1	0.7	0.025U	0.025U	0.025U	0.025U	0.053	0.18J	0.091	0.324
	8F2	0.71	0.015U	0.015U	0.015U	0.015U	0.038	0.12J	0.078J	0.236
	8F3	0.69	0.025U	0.025U	0.025U	0.025U	0.053	0.19J	0.11J	0.353
9	9F1	0.85	0.025U	0.025U	0.025U	0.025U	0.062	0.26	0.097	0.419
	9F2	0.86	0.025U	0.025U	0.025U	0.025U	0.057J	0.17J	0.1J	0.327
	9F3	1.4	0.015U	0.015U	0.015U	0.015U	0.048	0.14J	0.078	0.266
10	10F1	0.37	0.05U	0.05U	0.05U	0.05U	0.075	0.3	0.18	0.555
	10F2	0.46	0.025U	0.025U	0.025U	0.025U	0.071	0.24J	0.14	0.451
	10F3	0.39	0.025U	0.025U	0.025U	0.025U	0.061	0.24J	0.14	0.441

U - not detected at the sample quantitation limit

J - estimated concentration

Total Aroclors - Sum of the detected Aroclors

ID = identification

mg/kg = milligrams per kilogram

Results reported as wet weight

Table 8. Concentrations of Lead and PCBs in *Lepomis gibbosus*

Matteo Iron and Metal Site

West Deptford, NJ

July 2005

Station	Sample ID	Lead (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)	Total Aroclors (mg/kg)
Hessian Run (Station 4)	4F1L	0.6	0.025U	0.025U	0.025U	0.025U	0.081	0.24J	0.12	0.441
	4F2L	0.52	0.015U	0.015U	0.015U	0.015U	0.068	0.14J	0.069	0.277
	4F3L	0.47	0.05U	0.05U	0.05U	0.05U	0.1	0.27J	0.29J	0.66
Woodbury Creek (Station 9)	9F1L	0.17J	0.01U	0.01U	0.01U	0.01U	0.035	0.12	0.072	0.227
	9F2L	0.28	0.025U	0.025U	0.025U	0.025U	0.11	0.28	0.092	0.482
	9F3L	0.61	0.025U	0.025U	0.025U	0.025U	0.082	0.2	0.076	0.358

U - not detected at the sample quantitation limit

J - estimated concentration

Total Aroclors - Sum of the detected Aroclors

ID = identification

mg/kg = milligrams per kilogram

Results reported as wet weight

Table 9. Concentrations of Lead and PCBs in *Corbicula fluminea*

Matteo Iron and Metal Site

West Deptford, NJ

July 2005

Station	Sample ID	Lead (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)	Total Aroclors (mg/kg)
3	3B1	0.79	0.025U	0.025U	0.025U	0.025U	0.066J	0.19	0.032J	0.288
	3B2	0.54	0.025U	0.025U	0.025U	0.025U	0.07	0.19	0.025U	0.26
	3B3	0.44	0.025U	0.025U	0.025U	0.025U	0.078	0.22	0.026	0.324
4	4B1	0.78	0.025U	0.025U	0.025U	0.025U	0.084	0.23	0.029	0.343
	4B2	0.73	0.025U	0.025U	0.025U	0.025U	0.1	0.26	0.033	0.393
	4B3	0.91	0.025U	0.025U	0.025U	0.025U	0.1	0.26	0.036	0.396
5	5B1	0.52	0.025U	0.025U	0.025U	0.025U	0.072	0.2	0.026	0.298
	5B2	0.53	0.025U	0.025U	0.025U	0.025U	0.062	0.18	0.025U	0.242
	5B3	0.59	0.025U	0.025U	0.025U	0.025U	0.066	0.18	0.025U	0.246
8	8B1	1.3	0.025U	0.025U	0.025U	0.025U	0.041J	0.12	0.025U	0.161
	8B2	0.57	0.015U	0.015U	0.015U	0.015U	0.034J	0.093	0.021	0.148
	8B3	0.92	0.015U	0.015U	0.015U	0.015U	0.035J	0.1	0.021	0.156
9	9B1	0.38	0.01U	0.01U	0.01U	0.01U	0.029	0.082	0.013	0.385
	9B2	0.46	0.015U	0.015U	0.015U	0.015U	0.047	0.14	0.022	0.209
	9B3	0.5	0.015U	0.015U	0.015U	0.015U	0.048	0.14J	0.024	0.212
10	10B1	0.86	0.025U	0.025U	0.025U	0.025U	0.046J	0.13	0.032	0.208
	10B2	0.56	0.025U	0.025U	0.025U	0.025U	0.047J	0.13	0.027J	0.204
	10B3	1.0	0.015U	0.015U	0.015U	0.015U	0.03J	0.091	0.025J	0.146

U - Not detected at the samples quantitation limit

J - estimated concentration

Total Aroclors - Sum of the detected Aroclors

ID = identification

mg/kg = milligrams per kilogram

Results reported as wet weight

Table 10. Concentrations of Lead and PCBs in *Nuphar luteum*
 Matteo Iron and Metal Site
 West Deptford, NJ
 July 2005

Station	Sample ID	Lead (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)	Total Aroclors (mg/kg)
4	4PN1	9.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.015J	0.0083	0.0233
	4PN2	4.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.0095J	0.005U	0.0095
	4PN3	5.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.0053	0.0173
5	5PN1	8.4	0.005U	0.005U	0.005U	0.005U	0.005U	0.015J	0.008	0.023
	5PN2	6.7	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.0076	0.0216
	5PN3	7.6	0.005U	0.005U	0.005U	0.005U	0.005U	0.013J	0.0058	0.0188
6	6PN1	4.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.0088J	0.005U	0.0088
	6PN2	5.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.01J	0.0051	0.0151
	6PN3	3.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.0094J	0.005U	0.0094
8	8PN1	1.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PN2	1.4	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PN3	1.6	0.005U	0.005U	0.005U	0.005U	0.027	0.005U	0.005U	0.027

U - Not detected at the samples quantitation limit

J - estimated concentration

Total Aroclors - Sum of the detected Aroclors

ID = identification

mg/kg = milligrams per kilogram

Results in wet weight

Table 11. Concentrations of Lead and PCBs in *Zizania aquatica*

Matteo Iron and Metal Site

West Deptford, NJ

July 2005

Station	Sample ID	Lead (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)	Total Aroclors (mg/kg)
4	4PZ1	2.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	4PZ2	6.1	0.005U	0.005U	0.005U	0.005U	0.005U	0.007J	0.005U	0.007J
	4PZ3	5.6	0.005U	0.005U	0.005U	0.005U	0.005U	0.0052J	0.005U	0.0052J
5	5PZ1	1.3	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	5PZ2	3.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.0062	0.005U	0.0062
	5PZ3	1.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
6	6PZ1	8.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.0073J	0.0193
	6PZ2	6.0	0.005U	0.005U	0.005U	0.005U	0.005U	0.0084J	0.005U	0.0084
	6PZ3	7.1	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.0074J	0.0214
8	8PZ1	0.33	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PZ2	0.36	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U
	8PZ3	0.23J	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U

U - Not detected at the samples quantitation limit

J - estimated concentration

Total Aroclors - Sum of the detected Aroclors

ID = identification

mg/kg = milligrams per kilogram

Results in wet weight

Table 12. Concentrations of Lead and PCBs in Earthworms
 Matteo Iron and Metal Site
 West Deptford, NJ
 July 2005

Station	Sample ID	Lead (mg/kg)	Aroclor 1016 (mg/kg)	Aroclor 1221 (mg/kg)	Aroclor 1232 (mg/kg)	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)	Aroclor 1260 (mg/kg)	Total Aroclors (mg/kg)
4E	4E1	441	0.50U	0.50U	0.50U	0.50U	0.50U	2.9	3.1	6.0
	4E2	400	0.50U	0.50U	0.50U	0.50U	0.50U	2.4	2.4J	4.8
	4E3	511	0.50U	0.50U	0.50U	0.50U	0.50U	2.1	3.2J	5.3
4.5E	4.5E1	339	0.50U	0.50U	0.50U	0.50U	0.50U	3.5	5.6	9.1
	4.5E2	269	0.50U	0.50U	0.50U	0.50U	0.50U	2.5	4	6.5
	4.5E3	414	0.50U	0.50U	0.50U	0.50U	0.50U	2.5	3.2	5.7
5E	5E1	1090	0.075U	0.075U	0.075U	0.075U	0.075U	0.62	0.37	0.99
	5E2	1150	0.10U	0.10U	0.10U	0.10U	0.10U	0.69	0.37	1.06
	5E3	1100	0.10U	0.10U	0.10U	0.10U	0.10U	0.73	0.36	1.09
8E	8E1	4.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.005U	0.012
	8E2	25.1	0.025U	0.025U	0.025U	0.025U	0.025U	0.12J	0.025U	0.12
	8E3	5.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.005U	0.014

U - Not detected at the samples quantitation limit

J - estimated concentration

Total Aroclors - Sum of the detected Aroclors

ID = identification

mg/kg = milligrams per kilogram

Results in wet weight

Table 13. Summary of Food Chain Model Results
 Matteo Iron and Metal Site
 West Deptford, NJ
 July 2005

Assessment Endpoint	COPC	Acute Risk ^a	Risk ^b	Indeterminant Risk ^c	No risk ^d
Piscivorous Bird	Lead			X	
Great Blue Heron	PCB			X	
Piscivorous Bird	Lead			X	
Bald Eagle	PCB			X	
Piscivorous Mammal	Lead		X	X	
	PCB				
Omnivorous Bird	Lead		X		
	PCB			X	
Omnivorous Mammal	Lead		X		
	PCB		X		
Insectivorous Bird	Lead	X	X		
	PCB			X	
Insectivorous Mammal	Lead	X	X		
	PCB		X		
Herbivorous Mammal	Lead		X		
	PCB		X		

a - Only calculated for insectivorous birds and mammals

b - Hazard Quotient > 1 compared to both the LOAEL and NOAEL

c - Hazard Quotient < 1 compared to the LOAEL but > 1 compared to the NOAEL

d - Hazard Quotient < 1 compared to both the LOAEL and NOAEL

COPC = contaminant of potential concern

PCB = polychlorinated biphenyl

LOAEL = Lowest observed adverse effect level

NOAEL = No observable adverse effect level

Table 14. Food Chain Models for Mink, Great Blue Heron, Bald Eagle and Muskrat
Matteo Iron and Metal Site
West Deptford, NJ
July 2005

Species	COC	Conc. in Sediment (mg/kg d.w.)	Sediment Ingestion Rate (kg/day w.w.)	Total Ingested Sediment (mg/day)	Conc. in Water (mg/L)	Water Ingestion Rate (L/day)	Total Ingested Water (mg/day)	Conc. in Food (mg/kg w.w.)	Food Ingestion Rate (kg/day w.w.)	Total Food Conc. (mg/day)	Body Weight (kg)	Dose (mg/kg BW/day)	LOAEL (mg/kg BW/day)	HQ LOAEL	NOAEL (mg/kg BW/day)	HQ NOAEL
Mink	Lead	19,600	0.000687	13.465	0.0195	0.0604	0.001	1.6	0.408	0.653	0.454	31.10	80	0.4	8	3.9
	PCBs	35	0.000687	0.024	0	0.0604	0.000	0.674	0.408	0.275	0.454	0.66	0.1	6.6	0.05	13.2
Great Blue Heron	Lead	19,600	0.00058	11.368	0.0195	0.097	0.002	1.6	0.342	0.547	2.09	5.70	15	0.4	1.5	3.8
	PCBs	35	0.00058	0.020	0	0.097	0.000	0.674	0.342	0.231	2.09	0.12	0.94	0.1	0.094	1.3
Bald Eagle	Lead	19,600	0.00118	23.128	0.0195	0.14	0.003	1.6	0.700	1.120	3.63	6.68	15	0.4	1.5	4.5
	PCBs	35	0.00118	0.041	0	0.14	0.000	0.674	0.700	0.472	3.63	0.14	0.94	0.2	0.094	1.5
Muskrat	Lead	19,600	0.00289	56.644	0.0195	0.057	0.001	9.8	0.286	2.803	0.541	109.89	80	1.4	8	13.7
	PCBs	35	0.00289	0.101	0	0.057	0.000	0.027	0.286	0.008	0.541	0.20	0.1	2.0	0.05	4.0

mg/kg = milligrams per kilogram

kg/day = kilograms per day

mg/day = milligrams per day

mg/L = milligrams per liter

L/day = liters per day

d.w. = dry weight

w.w. = wet weight

mg/kg BW/day = milligrams per kilogram body weight per day

LOAEL = lowest observed adverse effect level

NOAEL = no observable adverse effect level

HQ = hazard quotient

PCBs = polychlorinated biphenyls

Conc. = concentration

COC = contaminant of concern

Table 15. Food Chain Models for Raccoon and the Wood Duck
Matteo Iron and Metal Site
West Deptford, NJ
July 2005

	Conc. in Sediment (mg/kg d.w.)	Sediment Ingestion Rate (kg/day)	Total Intake through Sediment (mg/day)	Conc. in Water (mg/L)	Water Ingestion Rate (L/day)	Total Intake through Water (mg/day)	Conc. in Plants (mg/kg w.w.)	Percent of Diet Plants	Conc. in Inverts. (mg/kg w.w.)	Percent of Diet Inverts.	Food Ingestion Rate (kg/day)	Total Food Conc. (mg/day)	Body Weight (kg)	Dose (mg/kg BW/day)	LOAEL (mg/kg BW/day)	HQ LOAEL	NOAEL (mg/kg BW/day)	HQ NOAEL
Raccoon																		
Lead	19,600	0.0376	736.96	0.0195	0.201	0.0039195	9.8	0.61	1.3	0.39	0.3624	2.350	2.2	336.05	80	4.20	8	42.01
PCBs	35	0.0376	1.316	0	0.201	0	0.027	0.61	0.396	0.39	0.3624	0.062	2.2	0.63	0.1	6.26	0.05	12.53
Wood duck																		
Lead	19,600	0.0065	127.4	0.0195	0.037	0.0007215	9.8	0.5	1.3	0.5	0.103	0.572	0.5	255.94	15	17.06	1.5	170.63
PCBs	35	0.0065	0.2275	0	0.037	0	0.027	0.5	0.396	0.5	0.103	0.022	0.5	0.50	0.94	0.53	0.094	5.30

mg/kg = milligrams per kilogram

kg/day = kilograms per day

mg/day = milligrams per day

mg/L = milligrams per liter

L/day = liters per day

d.w. = dry weight

w.w. = wet weight

mg/kg BW/day = milligrams per kilogram body weight per day

LOAEL = lowest observed adverse effect level

NOAEL = no observable adverse effect level

HQ = hazard quotient

PCBs = polychlorinated biphenyls

Conc. = concentration

Table 16. Food Chain Models for Short-tailed Shrew and American Robin
 Matteo Iron and Metal Site
 West Deptford, NJ
 July 2005

	Conc. in Soil	Soil Ingestion Rate	Total Ingested Soil	Conc. in Water	Water Ingestion Rate	Total Ingested Water	Conc. in Food	Food Ingestion Rate	Total Food Conc.	Body Weight	Dose	LOAEL	HQ LOAEL	NOAEL	HQ NOAEL
Short-tailed shrew	(mg/kg d.w.)	(kg/day w.w.)	(mg/day)	(mg/L)	(L/day)	(mg/day)	(mg/kg w.w.)	(kg/day w.w.)	(mg/day)	(kg)	(mg/kg BW/day)	(mg/kg BW/day)		(mg/kg BW/day)	
Lead	31,300	0.0007	21.91	0.0195	0.0028	0.0000546	1150	0.0078	8.970	0.0125	2470.40	80	30.9	8	308.8
PCBs	0	0.0007	0	0	0.0028	0	9.1	0.0078	0.071	0.0125	5.68	0.1	56.8	0.05	113.6
American robin															
Lead	31,300	0.0025	78.25	0.0195	0.0085	0.00016575	1150	0.0215	24.725	0.055	1872.28	15	124.8	1.5	1248.2
PCBs	0	0.0025	0	0	0.0085	0	9.1	0.0215	0.196	0.055	3.56	0.94	0.2	0.094	37.8

mg/kg = milligrams per kilogram

kg/day = kilograms per day

mg/day = milligrams per day

mg/L = milligrams per liter

L/day = liters per day

d.w. = dry weight

w.w. = wet weight

mg/kg BW/day = milligrams per kilogram body weight per day

LOAEL = lowest observed adverse effect level

NOAEL = no observable adverse effect level

HQ = hazard quotient

PCBs = polychlorinated biphenyls

Conc. = concentration

Table 17. Food Chain Models using Acute TRVs for Short-tailed Shrew and American Robin
Matteo Iron and Metal Site
West Deptford, NJ
July 2005

	Conc. in Soil	Soil Ingestion Rate	Total Ingested Soil	Conc. in Water	Water Ingestion Rate	Total Ingested Water	Conc. in Food	Food Ingestion Rate	Total Food Conc.	Body Weight	Dose	Acute TRV	Acute HQ
Short-tailed shrew	(mg/kg d.w.)	(kg/day w.w.)	(mg/day)	(mg/L)	(L/day)	(mg/day)	(mg/kg w.w.)	(kg/day w.w.)	(mg/day)	(kg)	(mg/kg BW/day)	(mg/kg BW/day)	
Lead	31,300	0.0007	21.91	0.0195	0.0028	0.0000546	1150	0.0078	8.970	0.0125	2470.40	320	7.7
PCBs	0	0.0007	0	0	0.0028	0	9.1	0.0078	0.071	0.0125	5.68	27	0.2
American robin													
Lead	31,300	0.0025	78.25	0.0195	0.0085	0.00016575	1150	0.0215	24.725	0.055	1872.28	625	3.0
PCBs	0	0.0025	0	0	0.0085	0	9.1	0.0215	0.196	0.055	3.56	394	0.01

mg/kg = milligrams per kilogram

kg/day = kilograms per day

mg/day = milligrams per day

mg/L = milligrams per liter

L/day = liters per day

d.w. = dry weight

w.w. = wet weight

mg/kg BW/day = milligrams per kilogram body weight per day

LOAEL = lowest observed adverse effect level

NOAEL = no observable adverse effect level

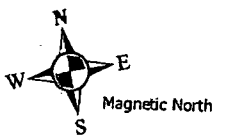
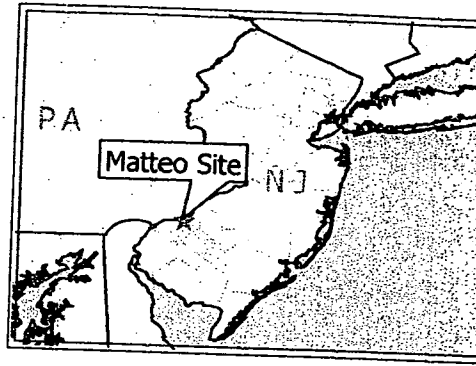
HQ = hazard quotient

PCBs = polychlorinated biphenyls


Conc. = concentration

TRV = toxicity reference value

Figures



Legend

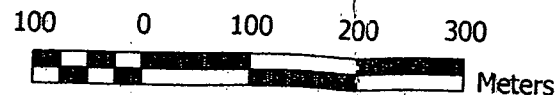
 Aquatic Biota Sampling Stations

Note: Sample locations are estimated based on Figure 1 of the Final Aquatic Study report prepared by the Louis Berger Group, Inc. December 30, 2004.

Map created using NJ DEP orthophotography
Sampling stations locations are estimated.

Map Creation Date: 16May2005

Coordinate system: New Jersey State Plane
FIPS: 2900
Units: Feet
Datum: NAD83



Data: g:\arcviewprojects\reac4\00-148
MXD file: g:\arcviewprojects\reac4\EAC00148_MatteoMetal\148_sitemap_f1
Revision Number: 004

U.S. EPA Environmental Response Team
Response Engineering and Analytical Contract
EP-C-04-032
W.A.# 0-148

Figure 1
Site Location Map
Matteo Iron and Metal Site
West Deptford Township, NJ

Appendices

APPENDICES

Appendix A

Appendix A: Toxicological Profiles
Matteo Iron and Metal Site
July 2005

TOXICITY PROFILES FOR MATTEO IRON AND METAL SITE

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July 2005

0148-DFR-071405

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1.0 DERIVATION OF TOXICITY REFERENCE VALUES

A toxicity reference value (TRV) is a contaminant dose level that is compared with a predicted exposure dose level, calculated based on site-specific data, to assess the presence and degree of risk to a receptor or group of receptors from that contaminant. A TRV is generally based on data from laboratory toxicological evaluations. Usually, two TRVs are used to predict ecological risk, a no observable adverse effect level (NOAEL) and a lowest observable adverse effect level (LOAEL). The NOAEL is the highest dose at which adverse effects are not expected to occur, and the LOAEL is the lowest dose at which adverse effects are expected to occur.

In order to derive TRVs, a comprehensive literature search was performed to identify studies on the toxicity of contaminants of concern (COCs) to ecological receptors. A variety of databases were searched, including Biological Abstracts, Applied Ecology Abstracts, Chemical Abstract Services, Medline, Toxline, BIOSIS, ENVIROLINE, Current Contents, Hazardous Substances Data Bank (HSDB), Registry of Toxic Effects of Chemical Substances (RTECS), Integrated Risk Information System (IRIS), and the Aquatic Toxicity Information Retrieval Database (AQUIRE).

In addition, a number of secondary literature sources provided summaries or reviews of toxicological literature related to a variety of contaminants. These documents were not used directly to derive TRVs because they do not capture the details of the toxicological methods needed for the selection of technically defensible TRVs. However, these summary documents provided an excellent source for locating original studies that may have been overlooked in the database searches. Examples of such summary documents include Agency for Toxic Substances and Disease Registry (ATSDR) documents, United States (U.S.) Fish and Wildlife Service Contaminant Hazard Reviews, U.S. Environmental Protection Agency (EPA) Great Lakes Water Quality Initiative documents, and U.S. EPA Ambient Water Quality Criteria documents.

Studies that were obviously not useful or appropriate for deriving a TRV were eliminated. A number of criteria were considered when evaluating the appropriateness of using a particular study for deriving a TRV. The most important consideration was the suitability of the test result for evaluating the assessment endpoint. A number of additional criteria were also considered. For example, studies were selected in which the test organism was in as similar a taxonomic grouping as possible to the measurement endpoint species. Exposure doses had to be quantified and effects measured and reported. The exposure duration was preferably either chronic, sub-chronic, or involved a sensitive life stage; multi generational studies were also appropriate. For laboratory studies, the likelihood that a similar result would be obtained if the test was repeated was an additional consideration. Sample sizes had to be adequate and the treatment groups must have been compared to appropriate control groups. At the very least, a negative control had to be included in the study design. In addition, the measured endpoints of the study had to be ecologically relevant. For the purposes of deriving a TRV for an ecological risk assessment, an ecologically relevant endpoint is one which is closely tied to the survival and viability of a population in the field. Usually, the endpoints measured for this purpose were survival, growth, and reproduction. In addition, appropriate statistical analyses must have been performed and the statistical significance reported. Finally, the study design preferably included at least three treatments in addition to any controls which may have been selected.

The selected TRVs were based preferably on high-quality studies which satisfy many or all of the above requirements. From these studies, the lowest concentration that was associated with adverse ecological effects on the test organism was selected as the LOAEL. Studies which reported both a LOAEL and NOAEL were selected over studies which reported only one effect level, due to the uncertainty associated with an unbounded effect level. If only a LOAEL could be identified from the studies, an uncertainty factor of 10 was used to calculate a NOAEL (Dourson and Stara 1983; U.S. EPA 1989; Sample *et al.* 1996; Amdur *et al.* 1996). If a LOAEL could not be located for a COC, a median lethal dose (LD₅₀) was selected; a factor of 10 was then used to calculate a LOAEL and a factor of 100 was used to calculate a NOAEL. Finally, if no adverse effect level could be located for a COC, the highest reported NOAEL was selected, and a factor of 10 was used to calculate a LOAEL. Professional judgement was used in some cases to select the most appropriate TRV.

The studies that were reviewed to derive toxicity reference values for this risk assessment are described below. Concentrations selected to be used as TRVs are summarized in Table 18.

Amdur, M.O., J. Doull, and C.D. Klaasen. 1996. *Casarett and Doull's Toxicology: The Basic Science of Poisons*. 5th Ed. New York: McGraw-Hill. p. 80-81.

Dourson, M.L. and J.F. Stara. 1983. Regulatory History and Experimental Support of Uncertainty (Safety) Factors. *Regulatory Toxicology and Pharmacology*. 3: 224-238.

Sample, B.E., D.M. Opresko, and G.W. Suter. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Prepared for the U.S. Department of Energy. ES/ER/TM-86/R3.

U.S. EPA (United States Environmental Protection Agency). 1989. *Risk Assessment Guidance for Superfund. Volume I. Human Health Evaluation Manual (Part A). Interim Final*. Office of Emergency and Remedial Response. EPA/540/1-89/002.

1.1 Lead

1.1.1 Lead Toxicity to Birds

1.1.1.1 Acute Toxicity

One-day old American kestrel (*Falco sparverius*) nestlings were orally dosed with metallic lead in corn oil at concentrations of 5 micrograms per liter ($\mu\text{g/L}$) corn oil (controls), 25 milligrams lead per kilogram body weight (mg Pb/kgBW), 125 mg Pb/kgBW or 625 mg Pb/kgBW daily for 10 days (Hoffman *et al.* 1985). Forty percent of the nestlings exposed to Pb at a concentration of 625 mg/kgBW were dead by day six. No mortality was observed in any other exposure group. Due to the acute nature of this study (short duration and high mortality), an exposure concentration of 625 mg/kgBW/day was selected to assess the short-term acute effects of Pb to birds in this risk assessment.

Hoffman, D.J., Franson, J.C., Pattee, O.H., Bunck, C.M. and A. Anderson. 1985. Survival, growth and accumulation of ingested lead in nestling American Kestrels (*Falco sparverius*). *Arch. Environ. Contam. Toxicol.* 14:89-94.

1.1.1.2 Chronic Toxicity

The gastric motility of adult male and female red-tailed hawks (*Buteo jamaicensis*) fed 0.82 and 1.64 mg/kg BW/day (mg/kgBW/day concentration reported by authors) for three weeks was evaluated through the use of surgically implanted transducers. Neither concentration had any effect on gastric contractions or egestion of undigested material pellets (Lawler *et al.* 1991).

Adult male and female red-tailed hawks were administered lead acetate by gavage at a concentration of 0.82 mg/kg BW/day for three weeks (Redig *et al.* 1991). Compared to control birds, there was an 83 percent (%) decrease in delta-aminolevulinic acid dehydratase (ALAD) activity and a 74 % increase in the levels of free porphyrins circulating in the blood of experimental birds. Immune function (as measured by antibody titers to foreign red blood cells or mitogenic stimulation of T-lymphocytes) was not significantly affected at this exposure level.

Beyer *et al.* (1988) fed red-winged blackbirds, brown-headed cowbirds, common grackles, northern bobwhites and eastern screech owls diets containing lead acetate. The dietary concentration was increased by 60 % weekly until half of the birds in each treatment group died. Because the exposure concentrations changed throughout the experiment, this study was not used to derive TRVs for this risk assessment.

One-day old American kestrel chicks were dosed orally with metallic Pb at concentrations of 0, 25, 125 or 625 mg/kgBW/day for 10 days (Hoffman *et al.* 1985a and 1985b). Forty percent of the birds

in the highest dose group died after six days of exposure. Growth rates of birds which received Pb at concentrations of 125 or 625 mg/kgBW/day were significantly lower than the growth rates of control birds.

The effect of Pb on survival of American kestrels was evaluated by feeding the birds either a control diet, or a diet containing mallard ducks which had died of Pb poisoning (mean Pb concentration was 29.3 mg/kg) for 60 days (Stendell 1980). No kestrels died or exhibited visible signs of Pb poisoning during the 60-day exposure period. An ingestion rate of 0.0307 kg/day (Barrett and Mackey 1975) and a body weight of 0.111 kg (Dunning 1993) were used to convert the exposure concentration to units of mg/kgBW/day. A NOAEL of 8.1 mg/kgBW/day was calculated based on the results of this experiment.

Ringed turtle doves received 0 or 100 micrograms per milliliter ($\mu\text{g}/\text{ml}$) Pb in their drinking water from two weeks prior to breeding throughout a breeding cycle (Kendall and Scanlon 1981). Exposure to Pb did not increase the time required to produce eggs, and no adverse effects on egg production or fertility were observed. Bone Pb concentrations in adult birds and bone and liver Pb concentrations in juveniles were higher than in control birds or progeny of control birds. A water ingestion rate of 0.017 L/day (calculated using an allometric equation from Calder and Braun 1983) and a body weight of 0.16 kg (Schwarzbach et al. 1991) was used to convert the exposure concentration to units of mg/kgBW/day. A NOAEL of 10.6 mg/kgBW/day was calculated based on the results of this experiment.

Bobwhite quail were fed diets supplemented with Pb (as lead acetate) at concentrations of 0, 500, 1,000, 1,500, 2,000 and 3,000 mg/kg for 6 weeks (Danron and Wilson 1975). Weight gain and food consumption were significantly decreased in birds receiving the two highest exposure concentrations. Mortality of birds receiving 3,000 mg/kg Pb was 46.7%, much greater than any other exposure group; however, it was not statistically significant due to large variability among replicate pens. In another experiment, male bobwhite were fed diets containing 0, 500, 1,000 or 1,500 mg/kg Pb (as lead acetate) for eight weeks. Mortality, food consumption, sperm concentration and sperm viability were measured; no effects were observed at any exposure concentration. A food ingestion rate of 0.0143 kg/day and adult body weight of 0.169 kg were used to convert the exposure concentrations to units of mg/kgBW/day; 2,000 mg/kg was selected as the NOAEL level. A NOAEL of 127 (exposure concentration of 1,500 mg/kg, endpoint measured sperm concentration and viability) and an estimated LOAEL of 1,270 mg/kgBW/day were calculated based on the results of this experiment.

Day-old mallard ducklings were fed diets supplemented with Pb-contaminated sediment at concentrations of 1.9 (control diet), 414 and 828 micrograms per gram ($\mu\text{g}/\text{g}$) for six weeks (Hoffman et al. 2000b). A clean sediment-supplemented control (24% sediment) and a positive control diet containing lead acetate at a concentration equivalent to the 828 $\mu\text{g}/\text{g}$ Pb-contaminated sediment diet were included in the experimental design. Mortality was observed only in the lead acetate group (7%), but was not significantly different from the control group. Hematocrit and hemoglobin were significantly lower in ducklings which received lead acetate. Blood ALAD activity levels were significantly lower and protoporphyrin levels were higher in both groups which received Pb-contaminated sediment and the ducklings which received lead acetate. Acid-fast renal tubular inclusion bodies and nephrosis are abnormalities associated with Pb poisoning; inclusion bodies were observed in 50% and tubular nephrosis was observed in 75% of ducklings fed lead acetate. Renal inclusion bodies were observed in two of nine ducklings from the 414 $\mu\text{g}/\text{g}$ group, and in 4 of 9 ducklings from the 828 $\mu\text{g}/\text{g}$ group. Growth was affected only in ducklings fed lead acetate. Based on the reduced growth observed in ducklings exposed to lead acetate at a concentration of 828 $\mu\text{g}/\text{g}$, this concentration was selected as the LOAEL for this experiment. A food ingestion rate of 0.0645 kg/day and body weight of 0.379 kg (cited by Sugden et al. 1981 for three-week old mallard ducklings) were used to convert the exposure concentrations to units of mg/kgBW/day. A LOAEL of 140.9 mg/kgBW/day and an estimated NOAEL of 14.1 mg/kgBW/day were calculated based on

results of this experiment.

Day-old Canada geese were fed diets supplemented with Pb-contaminated sediment concentrations of 1.9 (control diet), 414, 828 and 1,656 $\mu\text{g/g}$ for six weeks (Hoffman et al. 2000a). Mortality was observed only in the highest exposure group (22 %), but it was not significantly different from the control group. Hematocrit, hemoglobin, and ALAD activity were significantly lower and protoporphyrin levels were higher in the two highest exposure groups. Renal tubular degeneration was observed in one gosling from the 1,656 $\mu\text{g/g}$ group, but histopathologic lesions most commonly associated with Pb poisoning in waterfowl were not observed in other geese. Growth was decreased in goslings from the highest exposure group. Based on the reduced growth observed in goslings exposed to lead at a concentration of 1,656 $\mu\text{g/g}$, this concentration was selected as the LOAEL for this experiment. A food ingestion rate of 0.093 kg/day and body weight of 1.44 kg (cited in National Research Council 1994 for three-week old geese) were used to convert the exposure concentrations to units of mg/kgBW/day. A LOAEL of 107 mg/kgBW/day and an estimated NOAEL of 53.5 mg/kgBW/day were calculated based on results of this experiment.

Heinz et al (1999) studied the bioavailability and toxicity of Pb-contaminated sediment to adult mallards. In the first experiment, ducks were fed a pelleted commercial duck diet containing 0, 3, 6, 12 or 24 % Pb-contaminated sediment (103, 207, 414 and 828 $\mu\text{g/g}$ lead, respectively) for five weeks. Ducks fed the 24 % Pb-contaminated sediment exhibited atrophy of the breast muscles, green staining of the feathers around the vent, viscous bile, green staining of the gizzard lining, and renal tubular intranuclear inclusion bodies; one of 10 birds died. In the second experiment, the dietary concentration of the Pb-contaminated sediment was increased to 48 %, but only about 20 % was actually ingested due to food washing by the birds. Duration of this experiment was also five weeks. Protophyrin levels were elevated, and all of the Pb-exposed birds had renal tubular intranuclear inclusion bodies. A third experiment was conducted to determine if the effects of Pb were greater when birds were fed a nutritionally deficient diet. Ducks were fed a control diet, a commercial duck mash with 24 % Pb-contaminated sediment, or a ground corn diet with 24 % Pb-contaminated sediment for 15 weeks. Food washing was again observed; actual ingestion rates were 17 and 14 % for the Pb-contaminated duck mash and ground corn diets, respectively. Mortality occurred in four of five birds fed the Pb-contaminated ground corn diet. At necropsy, all birds fed the Pb-contaminated ground corn diet were emaciated, had renal tubular intranuclear inclusion bodies, and blackish-green bile. Based on the clinical signs of Pb poisoning observed in the first experiment, an exposure concentration of 828 $\mu\text{g/g}$ Pb was selected as the LOAEL from this experiment. An ingestion rate of 0.139 kg/day and body weight of 1.25 kg (Piccirillo and Quesenberry 1980) were used to convert the exposure concentrations to units of mg/kgBW/day. A LOAEL of 92 mg/kgBW/day and a NOAEL of 46 mg/kgBW/day were calculated based on the results of this experiment.

Day-old Japanese quail were fed diets containing Pb (as lead acetate) at concentrations of 0, 1, 10, 100, 500 or 1,000 mg/kg for five weeks (Morgan et al. 1975). Body weight, packed cell volume, and hemoglobin were significantly reduced in birds that received 1,000 mg/kg lead. At five weeks of age, testes size was also significantly reduced in the highest exposure group; this exposure concentration was identified as the LOAEL. Mean body weights of the 500 and 1,000 mg/kg exposure groups at three weeks were 65 and 55 g. Ingestion rates were calculated as a percent of the adult ingestion rate of 18 g/day (body weight of 0.12 kg; Varghese 2000), resulting in ingestion rates of 9.8 and 8.3 g/day, respectively. A LOAEL of 151 mg/kgBW/day and a NOAEL of 75.4 mg/kgBW/day were calculated based on the results of this experiment.

Nine raptors (five red-tailed hawks, three rough-legged hawks and one golden eagle) were administered 3 mg/kgBW Pb daily in the form of a lead acetate trihydrate solution by mouth for 30 weeks (Reiser and Temple 1980). Control birds (six red-tailed hawks, one Swainsons hawk) were dosed with a sodium acetate solution by mouth. Clinical signs of lead toxicosis (anorexia, green bile-stained feces and anemia) were observed in eight of the nine experimental birds. Three birds died

three to four weeks following the onset of clinical symptoms. This study was not used to derive the TRVs for this risk assessment because dosing was via solution rather than dietary, and because different species were included within the experimental group.

Edens et al. (1976) exposed Japanese quail to four dietary concentrations of lead acetate (1, 10, 100 and 1,000 mg/kg) for a period of 12 weeks. Percent hatch of settable eggs was significantly decreased in hens exposed to 100 mg/kg Pb. Dietary Pb at a concentration of 1,000 mg/kg almost completely suppressed egg production. The results from this experiment will be used to develop the NOAEL and LOAEL values because of the ecological significance of the endpoints and the method and duration of exposure. An ingestion rate of 18 g/day and adult body weight of 0.12 kg (Varghese 2000) were used to convert the exposure concentration to units of mg/kgBW/day. A LOAEL of 15 mg/kg BW/day (100 mg/kg) and a NOAEL of 1.5 mg/kg BW/day were calculated. Based on the ecological significance of the endpoint (reproduction) and because the LOAEL is the lowest cited adverse effect level for birds, the TRV values from this study will be used to evaluate the risk posed by Pb to avian receptors.

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1.1.2 Lead Toxicity to Mammals

1.1.2.1 Acute Toxicity

Schafer and Bowles (1985) conducted acute oral toxicity tests using deer mice to determine the Approximate Lethal Dose (ALD) for numerous chemicals. To determine the ALD, range finding tests were conducted. A single dose of lead (as triphenyl lead chloride) was administered by gavage and animals were observed for 3-days to determine mortality. One mouse was tested per dose concentration; each succeeding treatment was 50% higher than the preceding level and continued until mortality occurred. An ALD of 320 mg/kg was reported for Pb. Due to the acute nature of this study (short duration and mortality), this concentration was selected to assess the short-term acute effects of Pb to mammals in this risk assessment.

1.1.2.2 Chronic Toxicity

Mason and MacDonald (1986) evaluated the effect of Pb and cadmium (Cd) on otter (*Lutra lutra*).

Daily Pb intake was estimated on the basis of measured fecal Pb levels, the known ingestion rate for otter, and gastrointestinal Pb absorption rates for mammals. Estimated Pb intake correlated well with levels measured in major fish prey species. No apparent impact on population levels was found when the Pb intake was less than 0.15 mg/kg BW/day whereas otter populations were reduced in sites where the estimated Pb intake exceeded 2 mg/kg BW/day. This study was not used to derive a TRV for Pb, as other factors that may have influenced otter population levels were not evaluated.

Adult pregnant mice (C57Bl strain) were fed a diet containing Pb at concentrations of 0, 0.125, 0.25, 0.5, or 1 % for 48 hours following observation of the presence of a vaginal plug (Jacquet et al. 1976). Dietary Pb concentrations of 0.125 %, 0.25 %, and 0.5 % resulted in an increase in the number of embryos in the four-cell stage versus the eight-cell stage. At a dietary exposure level of 1 %, an increase in the number of undivided embryos was observed. In normal mouse embryo development, the embryo is in the eight-cell stage after 48 hours and is placed near the end of the oviduct ready to be discharged to the uterus. Effects of delayed cleavage on embryo loss prior to implantation is not known. An ingestion rate of 0.0058 kg/day and adult body weight of 0.033 kg (U.S. EPA 1988) were used to convert the exposure concentration to units of mg/kgBW/day. A LOAEL of 220 mg/kg BW/day (1,250 mg/kg), and an estimated NOAEL of 22 mg/kg BW/day were calculated based on the results of this experiment.

Pregnant female mice were given lead acetate in their drinking water at concentrations of 0, 500, 750 and 1,000 milligrams per liter (mg/L) starting on gestation day 12 and continuing to four weeks postpartum (Waalkes et al. 1995). Offspring were weaned and received Pb in their drinking water after weaning for 112 weeks. Renal lesions (atypical tubular hyperplasia or tumors) occurred rarely in control male mice (4 %) and increased in dose related fashion for Pb exposed male offspring: 500 ppm, 16 %; 750 ppm, 24 %; and 1,000 ppm, 48 %. The number of lesions in the 1,000 mg/L group was significantly higher than for the control group. Lead-treated females also developed renal lesions, but at much lower rates. An ingestion rate of 0.0058 kg/day and adult body weight of 0.033 kg (U.S. EPA 1988) were used to convert the exposure concentration to units of mg/kgBW/day. A LOAEL of 176 mg/kg BW/day (1000 mg/kg), and a NOAEL of 132 mg/kg BW/day were calculated based on results of this study.

Azar et al. (1973) administered Pb to rats at six dietary levels (1, 10, 50, 100, 1,000 and 2,000) for three generations and measured changes in reproduction and growth. No effects on number of pregnancies, number of pups born alive, fertility index, viability index or lactation index were observed at any exposure levels. An exposure concentration of 1,000 mg/kg resulted in reduced offspring weight and kidney damage in the young. An ingestion rate of 0.027 kg/day and adult body weight of 0.35 kg (U.S. EPA 1988) were used to convert the exposure concentration to units of mg/kgBW/day. A LOAEL of 80 mg/kg BW/day, and a NOAEL of 8 mg/kg BW/day were calculated. Based on the ecological significance of the endpoint (growth) and because the LOAEL is the lowest cited adverse effect level for mammals, the TRV values from this study will be used to evaluate the risk posed by Pb to mammalian receptors.

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1.2 Polychlorinated Biphenyls

1.2.1 Polychlorinated Biphenyl Toxicity to Birds

1.2.1.1 Acute Toxicity

A dietary concentration of 1500 mg/kg (dry weight) was administered to red-winged blackbirds for six days, by which time 50% of the birds had died (Stickel *et al.* 1984). Due to the acute nature of this study (short duration and high mortality), this dietary concentration was selected to assess the short term acute effects of polychlorinated biphenyls (PCBs) to birds in this risk assessment.

A body weight of 0.0415 kg (Dunning 1993) and a food ingestion rate of 0.0109 kg/day (Nagy 1987) were used to convert the exposure concentration to units of mg/kgBW/day, resulting in an acute exposure concentration of 394 mg/kgBW/day.

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1.2.1.2 Chronic Toxicity

A dietary concentration of 1500 mg/kg (dry weight) was administered to red-winged blackbirds for six days, by which time 50% of the birds had died (Stickel *et al.* 1984). Due to the acute nature of this study (short duration and high mortality), it was not used to assess the chronic effects of PCBs to birds in this risk assessment.

Mallard ducklings over 9 weeks of age, were fed a PCB-treated diet for 5 days, followed by 3 days of an untreated diet. The 8-day lethal concentration to half of the exposed organisms (LC50s) ranged from 1,975 mg/kg for Aroclor 1260 to 3,182 mg/kg for Aroclor 1242 (Heath *et al.* 1972). The lowest LC50 value was converted to a LOAEL of 197.5 mg/kg using an accepted conversion factor of 10. In order to express this value in units of mg/kg BW/day, a food ingestion rate of 0.0578 kg/day and a body weight of 0.936 kg reported for 8-week old mallard ducks were used (Sugden *et al.* 1981). This resulted in a LOAEL concentration of 12.2 mg/kg BW/day.

When Aroclor 1254 was fed to 9 month-old mallard hens at a concentration of 25 mg/kg, dry weight, in the diet for at least one month prior to egg laying, no detrimental effects on reproduction or nest attentiveness were observed (Custer and Heinz 1980). Assuming that the diet was one-third solids, this equates to a wet weight concentration of approximately 8.3 mg/kg. To convert this dosage to units of mg/kg BW/day, the dose was first multiplied by the food ingestion rate for the mallard duck of 0.139 kg/day, then divided by an adult body weight of 1.24 kg (Piccirillo and Quesenberry 1980) to yield a NOAEL of 0.92 mg/kg BW/day.

When screech owls were fed Aroclor 1248 in their diet at a concentration of 3 mg/kg for two breeding seasons, the number of eggs per clutch, hatchability, chick malformations, survival, and eggshell thickness were not affected (McLane and Hughes 1980). To convert to units of mg/kg BW/day, this value was divided by the reported mean body weight of 0.185 kg for screech owls (Dunning 1993) and multiplied by a food ingestion rate of 0.025 kg/day (Pattee et al. 1988). This resulted in a dietary exposure concentration (NOAEL) of 0.41 mg/kg BW/day.

Nestling white pelicans captured from the wild received 100 mg of Aroclor 1254 as daily oral doses for 10 weeks in addition to a controlled diet. Following the 10 week exposure period, the birds were stressed for an additional 2 weeks by reducing their food consumption in half. The initial mean body weight of the birds prior to the treatment was 6.2 kg. The mean body weight at the end of the 12 week experimental period was 4.8 kg. Micrograph examination of the livers from the birds in the treatment group indicated a 22% increase in hepatocyte size, a significant 25% increase in the number of mitochondria, a significant 20% fewer cristae per mitochondria, and a 22% increase in the number of lysosomes, microbodies, and other membrane-bounded vacuoles (Stotz and Greichus 1978). To convert to units of mg/kg BW/day, the dose (100 mg/day) was multiplied by the inverse of the lower mean body weight (from the end of the experimental period) to yield an exposure concentration of 20.8 mg/kg BW/day.

When Lillie et al. (1975) exposed chickens to diets containing either Aroclor 1016, 1232, 1242, 1248, or 1254 for 8 weeks, hatching success was significantly reduced at a concentration as low as 10 mg/kg (for Aroclor 1232 and Aroclor 1242), while no effects were noted at a concentration of 5 mg/kg. These values were converted to 0.71 and 0.36 mg/kg BW/day, respectively, using the reported body weight and ingestion rate for chickens indicated above. Similar results were described in Britton and Huston (1973), in which eggs from chickens fed diets containing 10 mg/kg Aroclor 1242 also exhibited reduced hatching success. Again, no effects were observed at a dietary concentration of 5 mg/kg. Similar results were also obtained by Scott (1977), in which hatching success was also decreased in chickens fed a diet containing 10 mg/kg Aroclor 1248. In this study, no effects were observed at 1 mg/kg. The value of 1 mg/kg was converted to a NOAEL of 0.071 mg/kg BW/day using a body weight of 1.45 kg and an ingestion rate of 0.103 kg/day for adult chickens (U.S. EPA 1988).

When Platanow and Reinhart (1973) exposed chickens to Aroclor 1254 in the diet, a concentration of 5 mg/kg resulted in a decrease in both egg production and female fertility. This concentration was converted to a dietary dosage of 0.36 mg/kg BW/day using the reported body weight and ingestion rate indicated above. Finally, when Lillie et al. (1974) exposed chickens to diets containing either Aroclor 1221, 1232, 1242, 1248, 1254, or 1268, chick growth was significantly reduced at a concentration as low as 2 mg/kg (for Aroclors 1248 and 1254). To convert this concentration to units of mg/kg BW/day, the body weight and ingestion rate indicated above were used, yielding a dietary dosage of 0.14 mg/kg BW/day.

Yearling male American kestrels were fed prey items (day-old cockerels) containing approximately 33 mg/kg, wet weight, of Aroclor 1254 for 62 to 69 days. This dose was converted by the investigators to a daily exposure concentration of 9 to 10 mg/kg BW/day. Kestrels receiving the treated diet exhibited a significant 22 to 27% reduction in sperm concentrations. This response was associated with a muscle PCB concentration of 107 mg/kg, lipid normalized, and a testes concentration of 128 mg/kg, lipid normalized (Bird et al. 1983).

Male and female pairs of American kestrels were fed diets containing 3 mg/kg, wet weight, of Aroclor 1248 incorporated into a commercial diet for approximately 20 weeks. Eggs were collected from the pairs 2 to 4 days after egg-laying was complete. The eggs collected from the treated pairs of birds exhibited a 5% reduction in eggshell thickness. This response was associated with a parent muscle tissue PCB concentration of 18.5 ± 5.1 mg/kg, wet weight (Lowe and Stendell 1991). An ingestion rate of 0.0307 kg/day (Barrett and Mackey 1975) and a body weight of 0.111 kg (Dunning 1993) were

used to convert the exposure concentration to units of mg/kgBW/day, resulting in a LOAEL of 0.83 mg/kgBW/day. A recent summary paper by Peakall and Lincer (1996) indicates that PCBs do not cause eggshell thinning except at very high doses that are likely to cause other reproductive toxicological effects as well. Therefore, the LOAEL based on this study was not used to derive a TRV for evaluating the dietary toxicity of PCBs in birds.

Summer et al. (1996a) exposed white Leghorn hens for eight weeks with commercial diets mixed with contaminated carp from Saginaw Bay, Lake Huron. The concentrations of PCBs in the resulting diets, measured as the sum of Aroclors 1242, 1248, 1254, and 1260, were 0.3 mg/kg (control), 0.8 mg/kg, and 6.6 mg/kg, wet weight. Hens were artificially inseminated weekly, and food consumption, body weights, and egg production were monitored daily. Food consumption initially declined in all the treatment groups but was greatest in the high dose group by the end of the study. Body weights were greater in the control and the low dose groups by the end of the study. Finally, egg production initially decreased during the acclimation period prior to the study, but egg production in the high dose group returned to pre-trial levels by the end of the study while egg production in the control and the low dose group remained significantly lower. The decreased egg production, as well as the increased body weights, in the control and the low dose group were explained by the authors as effects of fatty liver hemorrhagic syndrome (FLHS), with which the necropsy results were consistent. It was hypothesized that the PCBs in the high dose group provided a protective mechanism against FLHS, thus resulting in the higher egg production, since this protective mechanism had been observed in other studies. In a second phase of this experiment (Summer et al. 1996b), eggs were allowed to develop through day 25 of incubation, and hatching and deformity rates were observed and noted. Rates of deformities correlated with concentrations of PCBs in food, and both treatments (0.8 and 6.6 mg/kg, wet weight, in the diet) produced significantly higher rates of deformities (24% and 40%, respectively) compared to the control (17%). To convert the lower PCB treatment concentration (0.8 mg/kg, wet weight) to units of mg/kg BW/day, the average daily PCB consumption of hens in this treatment group reported by the authors (Summer et al. 1996a) for the 8-week duration of the study (67.1 ug/day) was divided by the corresponding average body weight (1620 g) to obtain a dietary dosage of 0.0414 mg/kg BW/day. To convert the control PCB concentration (0.3 mg/kg, wet weight) to units of mg/kg BW/day, the average daily PCB consumption of hens in this treatment group reported by the authors (Summer et al. 1996a) for the 8-week duration of the study (26.75 ug/day) was divided by the corresponding average body weight (1690 g) to obtain a dietary dosage of 0.0158 mg/kg BW/day. Although this study provided the lowest LOAEL and NOAEL of the studies presented here, these values were not selected for use in this risk assessment because the food source for the study came from an area that is known to contain a variety of pollutants in addition to PCBs, and the contribution of these other contaminants to the effects observed in this study are unknown.

Another study investigated the behavioral component of reproduction in mourning doves given dietary supplements of 0, 10, or 40 mg/kg Aroclor 1254 (Tori and Peterle 1983). The exposure concentrations were converted to units of mg/kgBW/day using an ingestion rate of 0.0112 kg/day and a body weight of 0.1 kg (Kenaga 1973), resulting in doses of 0, 1.12 mg/kg BW/day, and 4.48 mg/kg BW/day. Control doves displayed normal courtship behaviors and patterns. Doves that were fed at the 10 parts per million (ppm) (1.12 mg/kg BW/day) level spent twice as much time in the courtship phase as the control birds, with only 50% completing courtship and nesting. Of the 50% that did nest and incubate eggs, nest initiation was significantly delayed, resulting in a delay in egg laying as well. None of the doves on the 40 ppm dietary supplement completed the nesting process (Tori and Peterle 1983). The authors hypothesized that the decline of reproductive activity was induced by the degradation of estrogen and androgen in the birds, which is presumably a result of increased hepatic microsomal enzyme activity as a response to the presence of PCBs.

Peakall and Peakall (1973) maintained ring doves on a diet that contained 10 mg/kg Aroclor 1254. They found that reproductive success was dependent on exposure of the female to the PCB compound. Females fed PCB-spiked food were less attentive to their nest and had erratic nesting behaviors which

interfered with egg development. Artificial incubation greatly increased the breeding success for these birds. The food concentration of 10 mg/kg was converted to units of mg/kg BW/day using an ingestion rate of 0.015 kg/day and a body weight of 0.160 kg (Schwarzbach et al 1991), resulting in a LOAEL of 0.94 mg Aroclor 1254 /kgBW/day. Similar values were obtained by Peakall et al. (1972) for the ringed turtle dove, in which a dietary Aroclor 1254 concentration of 10 mg/kg adversely affected hatching success due to heavy embryonic mortality.

The results of the Peakall and Peakall (1973) and Peakall et al. (1972) studies were selected for use in this risk assessment due to the significance of the endpoints (reproductive success and behavior) and the specificity of the test chemical (PCBs only). Therefore, a LOAEL of 0.94 mg/kg BW/day and an estimated NOAEL of 0.094 mg/kg BW/day will be used in this risk assessment to evaluate the risk from PCBs to avian species.

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1.2.2 Polychlorinated Biphenyl Toxicity to Mammals

1.2.2.1 Acute Toxicity

In a preliminary study to determine the cause of reproductive complications in mink fed Great Lakes fish, adult breeder mink were fed a basal diet supplemented with 30 mg/kg of PCB for six months (181 days). All of the mink died, emaciated, by the end of the experimental period (Aulerich and Ringer 1977).

Adult body weights ranging from 0.454 to 2.31 kg have been reported (Mumford and Whitaker 1982, Nowak 1991). Food ingestion rates have been measured in several studies (Bleavins and Aulerich 1981; Aulerich et al. 1986; Heaton et al. 1995). Reported food ingestion rates range from 0.129 to 0.409 kg/day. A body weight of 0.454 kg and food ingestion rate of 0.409 kg were used to convert the exposure concentration to units of mg/kgBW/day. A concentration of 27 mg/kgBW/day was used to evaluate acute exposure of mammals to PCBs.

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1.2.2.2 Chronic Toxicity

Several studies were found pertaining to the dietary toxicity of PCBs to mink, most of which examined effects on reproduction, growth and survival. Since the mink is the most sensitive mammal species tested to date, these studies were the only studies reviewed to derive a TRV for mammals for this risk assessment.

In a preliminary study to determine the cause of reproductive complications in mink fed Great Lakes fish, adult breeder mink were fed a basal diet supplemented with 30 mg/kg of PCBs for six months (181 days). However, all of the mink died, emaciated, by the end of the experimental period (Aulerich

and Ringer 1977). As a result of the preliminary study, a long-term study was conducted to determine the effects of long-term, low-level consumption of PCBs on growth. Mink were fed a basal diet supplemented with 5 and 10 mg/kg of PCBs for a period of approximately 8.5 months. The basal diet plus 10 mg/kg of PCBs resulted in a significant 56% decrease in body weight gain after a period of 4 months. Body weight gain was reduced by 39% in the 5 mg/kg treatment group, but this reduction was not statistically significant. Both the 5 and 10 mg/kg treatment groups failed to produce offspring; the control group produced 17 live and 8 dead kits. Various degrees of embryotoxicity were observed during necropsy of the treated animals (Aulerich and Ringer 1977). The 5 and 10 mg/kg doses were converted to daily exposure concentrations by multiplying them by a food ingestion rate of 0.249 kg/day (U.S. EPA 1993) and dividing by a body weight of 1.13 kg (Merritt 1987). This yielded exposure concentrations of 1.1 and 2.2 mg/kg BW/day for the 5 and 10 mg/kg treatment groups, respectively.

Based on the results of the above experiment, another experiment was conducted to determine the effects of long-term consumption of low-level PCBs on reproduction. Fifteen mg/kg of Aroclor 1254 in the diet resulted in a complete inhibition of reproduction and 31% adult mortality, compared to 6% mortality in the controls. Five mg/kg of Aroclor 1254 resulted in a 95% reduction in the number of kits born live; the ratio of live kits to female adults was reduced by 87%. In an effort to determine the persistence of the impaired reproductive condition, 11 adult females that received 5 mg/kg of Aroclor 1254 for a period of six months were placed on a control diet for one year. The results indicate that the impaired reproductive performance of these females was not a permanent condition (Aulerich and Ringer 1977). The 5 and 15 mg/kg doses were converted to daily exposure concentrations using the conversion factors cited above, resulting in exposure concentrations of 1.1 and 3.3 mg/kg BW/day, respectively.

Eight month old mink fed a basal diet containing 1.0 mg/kg of Aroclor 1254 for a period of approximately six months exhibited no mortality or any significant changes in the thyroid, pituitary, adrenal glands, or serum T3 and T4 levels (Wren et al 1987a). Reproduction and kit development was evaluated under the same test conditions in a separate study (Wren et al. 1987b) by the same investigators. Male fertility and female offspring production were not affected by the 1.0 mg/kg Aroclor 1254 diet. However, growth rate of kits nursed by exposed mothers was significantly reduced. The investigators estimated the daily exposure concentrations to be 0.10 mg/kg BW/day for males and 0.18 mg/kg BW/day for females. Results from this study were not used to derive the TRV for this risk assessment, as growth is not an ecologically significant endpoint.

When Kubiak and Best (1991) fed mink a liver diet contaminated with PCBs, a concentration of 1.0 mg/kg PCBs resulted in reproductive impairment and a concentration of 5 mg/kg resulted in mortality. This dose was converted to a daily exposure concentration by multiplying it by an ingestion rate of 0.249 kg/day (U.S. EPA 1993) and dividing by a body weight of 1.13 kg (Merritt 1987). This resulting in a LOAEL of 0.22 mg/kg BW/day.

In another study, one-year-old mink were fed a diet of beef and cereal prepared from cows which had been given 10 consecutive daily oral doses of 1 and 10 mg/kg of Aroclor 1254 dissolved in an olive oil and dairy concentrate (Platanow and Karstad 1973). The cows did not exhibit any clinical, gross, or histopathological signs of PCB toxicity. The cows were killed 24 hours following the last dose, and the musculature, liver, and kidneys ground and mixed with commercial mink food cereal at a level of 24 % cereal. The resulting rations containing 0.64 and 3.57 mg/kg of total PCB were fed to mink for a period of 160 days. The mink were fed this diet *ad libitum* 2 months prior to the breeding season and continued for 160 days. All 16 mink that were fed 3.57 mg/kg of PCBs died by day 105. Two of the 16 mink that were fed 0.64 mg/kg died by days 122 and 129. The mink exhibited poor appetites, lethargy, and weakness before dying. Some passed tarry feces, indicating gastrointestinal hemorrhaging. At both treatment levels, males survived longer than females. An ingestion rate of 0.249 kg/day (U.S. EPA 1993) and a body weight of 1.13 kg (Merritt 1987) were used to convert the

exposure concentrations to units of mg/kgBW/day. This yielded exposure concentrations of 0.14 and 0.78 mg/kg BW/day for the 0.64 and 3.57 mg/kg doses, respectively.

In another study, male and female ranch-bred mink were acclimated to a diet consisting of ocean fish scraps, commercial mink cereal, and meat by-products. Ocean fish scraps made up 40 % of this diet. Dietary treatment levels were prepared by substituting 10, 20, and 40 % of the ocean fish scraps with PCB-contaminated carp from Saginaw Bay, Lake Huron. The mean dietary PCB concentrations were 0.015 mg/kg (control), 0.72 mg/kg (10 % carp), 1.53 mg/kg (20 % carp), and 2.56 mg/kg (40 % carp). Groups of 15 mink (3 males, 12 females) were assigned to one of the four treatment groups for a period of 12 weeks. Mink receiving the highest PCB-containing diet (40 % carp or 0.32 mg/kg BW/day, as reported by the investigators) exhibited a 42 % reduction in mean litter size, 86 % fewer live kits at birth, and no kits surviving beyond 24-hours post-partum. Even mink receiving the 10 % carp diet (or 0.13 mg/kg BW/day, as reported by the investigators) exhibited a 67 % reduction in kits surviving three to six weeks relative to the control (Heaton et al. 1995). This study cited a LOAEL of 0.13 mg/kgBW/day and a NOAEL of 0.004 mg/kgBW/day for exposure of mink to PCBs.

In a related study on multigenerational effects in mink fed the same Saginaw Bay PCB-contaminated carp, Restum et al. (1998) observed a significant reduction in kit body weights after parental exposure to 0.25 mg/kg, wet weight of PCBs in fish (0.05 mg/kgBW/day as reported by authors). A significant reduction in kit survival was observed at a parental exposure concentration of 0.5 mg/kg (0.1 mg/kgBW/day). The concentration of 0.1 mg/kg was selected as the LOAEL for this risk assessment, as effects on reproduction or survival were targeted as ecologically significant effects. Of note in this study was that adverse effects on kit survival were observed even several months after the parents had been placed on the control diet. The inference was that long-term effects on mink can be observed even after short exposure periods to a PCB-contaminated diet. A LOAEL of 0.1 mg/kgBW/day and a NOAEL of 0.05 mg/kgBW/day will be used to evaluate risk from exposure to PCBs for mammals.

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Appendix B

Appendix B: Receptor Species Life History and Exposure Profiles
Matteo Iron and Metal Site
July 2005

LIFE HISTORIES FOR MATTEO IRON AND METAL SITE

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1.0 AVIAN COMMUNITY

1.1 Great Blue Heron, (*Ardea herodias*): Piscivorous Bird

Life History

The great blue heron is the largest and most widely distributed American heron, inhabiting lakes, ponds, rivers, marshes and occasionally newly-plowed fields and meadows (Bull and Farrand 1977; Eckert 1987). The great blue heron is migratory in the northernmost portion of its range. Lingered birds usually fall prey to severe weather (Bull and Farrand 1977). Southward migration begins in early October; northward migration begins in March or early April (Eckert 1987). The great blue heron has a blue-grey back with blackish sides and a white and grey striped belly. The head has a white crown, cheeks and throat. A black stripe on the side of the crown merges into a long occipital crest. The bill is yellow and legs are a greenish-brown. The sexes have similar plumage, but females are smaller. With the exception of its breeding season, this species is solitary in its habits (Hancock and Kushlan 1984).

Great blue herons are primarily diurnal, but nocturnal foraging is common in tidal habitats (Hancock and Kushlan 1984). They feed anywhere they can locate prey (terrestrial or aquatic), but they primarily forage in shallow water less than 50 centimeters (cm) deep (Bent 1926; Bayer 1978). The great blue heron typically feeds either by standing motionless in the water waiting for prey, or by searching stealthily with a slow and careful walk. Their primary food item is fish, although frogs, small turtles, crustaceans, mice, voles, shrews, snakes, and ground-nesting birds are also consumed. Great blue herons generally capture fish ranging from 5 to 40 cm in length, although larger fish are occasionally consumed (Kirkpatrick 1940; Willard 1977). Almost without exception, the great blue heron will shake its bill in the water immediately after swallowing prey, perhaps to wash off debris. Although the digestive fluids of the heron are acidic enough to dissolve bone rapidly, an occasional undigested pellet of feathers and fur is regurgitated (Eckert 1987; Butler 1992).

Courtship occurs soon after the spring migration, with copulation usually occurring on the ground. Great blue herons are mostly monogamous, with new mates selected each year (Butler 1992). Colonial nests are placed on the uppermost branches of trees or shrubs. Occasionally a ground nest will be built if a secluded area is available. Successful nesting areas are usually returned to year after year. Three to seven pale greenish-blue eggs are incubated equally by both sexes for about 28 days (Eckert 1987). The chicks fledge at about 2 months of age. Nesting success depends on food supplies, and most nestling loss is due to starvation (Quinney 1982). Heron chicks weigh approximately 50 grams (g) at hatching, and will attain about 86 percent (%) of their adult weight by 45 days of age (Quinney 1982). Fish fed to chicks range in size from 7.8 cm to 22.8 cm (Hoffman 1978). Great blue herons do not reach sexual maturity until 2 years of age (DeGraaf and Yamasaki 2001).

Very few birds or animals will attack an adult great blue heron. Adult mortality due to attempting to swallow large fish, starvation, or entanglement in utility wires has been reported (Terres 1980). Crows, ravens, owls, eagles, gulls, bears and raccoons prey on the eggs and nestlings (Bent 1926; Hancock and Kushlan 1984). Mortality rates are 69% in the first year, decreasing thereafter (Bayer 1978); the maximum recorded lifespan for a great blue heron is 23 years, 3 months (Clapp et al. 1982).

Exposure Profile

For this risk assessment, conservative exposure parameters are the highest (ingestion rates) or lowest (body weight [BW], home range [HR] size) values located in the literature.

Adult great blue heron BW range from 2.09 to 3.64 kilograms (kg) (Hartman 1961; Palmer 1962; Alexander 1977; Hoffman 1978; Quinney 1982; Eckert 1987; Schramm et al. 1987; Butler 1992;

Environment Canada 1998). Males tend to be slightly larger than females. A conservative BW of 2.09 kg was used in exposure calculations.

Great blue herons are opportunistic predators, and will consume whatever prey are available. Fish are the preferred food item for this species. Based on stomach contents, Palmer 1962 reported a diet comprised of 71.6% fish, 8.2% insects, 8.9% crustaceans, 4.3% herptiles, and 4.7% small mammals. Cottam and Uhler 1945 reported a dietary composition of 43% non-game fish, 25% game or commercial fish, 8% insects, 8% crustaceans, 4% herptiles, and 5% small mammals. Kirkpatrick (1940) reported a dietary composition of 92% fish, 1.7% insects, 2% crustaceans, 4% herptiles and 0.3% small mammals delivered to nestlings by adults. Alexander (1977) reported a dietary composition of 94% fish, 1% crustaceans, 3% amphibians, and 1% bird and mammal, percentage by weight of stomach contents. For this risk assessment, it was assumed that great blue herons consume 100% fish.

Food ingestion rates ranging from 0.202 kilograms per day (kg/d) to 0.343 kg/d have been reported for this species (Powell 1983; Schramm et al. 1987; Hoy et al. 1989; Littauer 1990; Stickley et al. 1995; U.S. Department of Agriculture 1997). A conservative food ingestion rate of 0.343 kg/d will be used in this risk assessment.

A species-specific water ingestion rate could not be located for the great blue heron. Water ingestion rates were calculated using the allometric equation developed by Calder and Braun (1983): $WI \text{ (liters per day [L/d])} = 0.059 Wt^{0.67}$, where WI is the daily water ingestion rate and Wt is the BW in kg. Using the above BW, a conservative water ingestion rate of 0.097 L/d was calculated.

An incidental sediment ingestion rate for the great blue heron was not located in the literature; therefore, a predicted incidental ingestion rate for sediment that may be entrained in the digestive system of prey items was used for this risk assessment. Fish are the primary food source for the great blue heron; consumption of prey items containing sediment is assumed to be the primary mechanism by which a piscivorous bird such as the great blue heron would ingest sediment. In this model, the bluegill (*Lepomis macrochirus*) was used to represent fish eaten by the great blue heron.

Bluegills commonly reach a size of 12 ounces (oz) (Pflieger 1975). From this, the amount of sediment entrained in fish 12 oz (0.340 kg) in weight was predicted. A study evaluating the stomach contents of 153 bluegills reported the diet to contain an average of 9.6% detritus (Kolehmainen 1974). A daily food ingestion rate of 1.75% of the BW per day has been reported for the bluegill (Kolehmainen 1974). From this, the amount of food consumed by a 0.340 kg bluegill is calculated to be 0.00595 kg/d. If the assumptions are made that 9.6% of the material ingested is sediment, and that the amount of sediment contained in the digestive system of a fish remains constant over time, it can be predicted that a fish of this size may contain 0.0005712 kg of sediment in its digestive system. This value (0.0005712 kg) was divided by the predicted fish BW (0.340 kg) to express the sediment entrained in the fish digestive systems as 0.00168 kg sediment per kg fish BW. When this value is multiplied by the conservative food ingestion rate of the great blue heron (0.343 kg/d), the predicted sediment ingestion rate for a heron consuming 100% fish is approximately 0.00058 kg/d.

Feeding territory sizes have been reported for this species in terms of kilometers (km) shoreline length and area (in hectares [ha]). In addition, foraging distances from nesting colonies have been measured. Foraging distances ranging between 1.8 to 34.1 km from nesting colonies have been reported (Mathisen and Richards 1978; Thompson 1978; Peifer 1979; Dowd and Flake 1985). Dietary exposure to contaminants will occur within a feeding territory; the distance traveled to a feeding territory is not a factor. Therefore, feeding territory sizes as km shoreline length and measured feeding territory areas will be considered in this risk assessment. Actively defended foraging areas ranging from 0.129 to 4.1 km of shoreline length have been reported for this species (Bayer 1978; Peifer 1979; Dowd and Flake 1985). Measured mean feeding territory sizes of 0.6 and 8.4 ha were reported by Bayer 1978. For this risk assessment, it was assumed that a great blue heron would obtain 100% of its food from the Matteo Iron and Metals Site.

In summary, the food chain model parameters for the great blue heron are as follows:

Conservative Scenario:

BW:	2.09 kg
¹ Total ingestion:	0.343 kg/d
¹ Food ingestion:	0.34242 kg/d
Water ingestion:	0.097 L/d
Sediment ingestion, fish diet:	0.00058 kg/d

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1.2 Bald Eagle, (*Haliaeetus leucocephalus*): Piscivorous Bird

Life History

The bald eagle is one of the largest birds in the raptor family. It is generally a dark brown color with yellow eyes, bill and talons. The adult bald eagle is easily distinguished from other eagles by the white coloration of head, neck and tail feathers, usually acquired around their fifth year (Brown and Amadon 1968; Burton 1989). The bald eagle ranges from throughout North America south to southern Florida and the coast of Baja California (Johnsgard 1990). It tends to be restricted to coastal areas, or to areas near lakes and rivers. There is a size difference between the sexes, with females being larger than males. Sizes also vary geographically, with northern bald eagles being larger than those from southern regions (Green 1985).

In most locations, bald eagles do not migrate, but birds found in northern areas will migrate away from areas that become completely frozen over in winter, while birds from Florida often show a reverse migration, going north in the midsummer and returning to the south in the autumn or winter (Brown and Amadon 1968; Burton 1989). The typical home range (HR) area for nesting bald eagles is 660 ha per nesting pair (Johnsgard 1990).

Bald eagles locate food primarily by sight by observing the area beneath them either when perching or during flight. They are primarily carrion feeders but are known to be opportunistic, taking advantage of any available food source. The staple diet of the eagle is dead or dying fish (Palmer 1988). However, the eagles may catch large numbers of waterfowl, especially when the prey are in restricted areas, such as a small patch of open water surrounded by ice (Brown and Amadon 1968). Bald eagles have also been known to prey on small mammals in times of food shortage.

Bald eagle breeding pairs remain together as long as they live (Palmer 1988; Johnsgard 1990). The distance from human disturbance is important for nest selection. Nests are usually built in trees in old growth strands or on rocks where there are no trees. The nests are very large and made of sticks lined with a softer material such as pine needles. Nests are used over many years with new layers of materials added during each breeding season (Green 1985; Johnsgard 1990). The typical bald eagle nest can measure up to 2.4 meters wide and nearly the same depth (O'Gara 1994). They are often located in areas where the eagle has a commanding view, such as old growth strands of timber, typically taller than their surroundings (Palmer 1988). The nests are usually built near water; during the breeding season, eagles require a large foraging area near water. The breeding season varies with location. One to three eggs (usually 2) are laid; incubation lasts 5 weeks (Palmer 1988; Johnsgard 1990). Eagles lay one clutch per year, although they may lay a replacement clutch if the initial clutch is lost (Green 1985; Palmer 1988). Eggs are usually colored white, but sometimes have a slight blue coloration. The young are able to fly at just over 10 weeks old, but do not achieve the white head and tail feathers until 4 to 5 years of age (Palmer 1988; Johnsgard 1990).

The bald eagle is a federally designated endangered species. High mortality occurred prior to the 1970s due to hunting and from egg breakage from organochlorine pesticide exposure. Bald eagle numbers have rebounded significantly since 1970 and the species is currently under consideration for being delisted under the Endangered Species Act.

Eagle mortality is caused by a variety of factors, including widespread acid deposition, which affects the food supply, and the ingestion of lead shot in waterfowl carcasses that the eagles feed on as carrion (Green 1985; Palmer 1988). The average life span of a bald eagle is around 15-20 years in the wild (Green 1985).

Exposure Profile

For this risk assessment, conservative exposure parameters are the highest (ingestion rates) or lowest (body weight [BW], HR size) values located in the literature.

Adult eagles may weigh anywhere from 3.63 to 6.4 kg (Chura and Stewart 1967; Brown and Amadon 1968; Snyder and Wiley 1976; Palmer 1988; Gerrard 1992). Females are significantly larger than males, and body size increases with latitude. This weight difference is the basis for the distinction between the northern and southern subspecies. The lowest reported BW of 3.63 kg was used in this risk assessment.

Bald eagles are piscivorous, feeding primarily on birds and fish, though they will eat other animal matter (including carrion). The bald eagle often shows preference towards food sources that are readily or most easily attained. The bald eagle generally prefers eating dead or dying prey as opposed to hunting, and also tries to steal food, especially from other eagles, when given the opportunity. The bald eagle diet may vary greatly depending on the availability of prey at each location. In Texas, the bald eagle diet consisted of 30.1% fish, 5.5% mammals, 33.7% birds and 30.7% reptiles (Mabie 1995). In Arizona, however, the bald eagle diet was comprised of 75.5% fish, 14.3% mammals and 10.2% birds (Hunt 2002). Combining data from different regions, the bald eagle diet is comprised of approximately 51% birds, 39% fish, 7% mammals, and 3% reptiles (Dunstan and Harper 1975; McEwan and Hirth 1980; Fielder 1982; Todd 1982; Dugnoni 1986; Mabie 1995; Hunt 2002; Watson 2002). It should be noted, however, that the overall percentage of fish in the diet may be underestimated, since most of the above studies used the remains of prey in the nest as a basis for determining dietary composition. Such analyses may be biased because fish remains are less likely to be found than are remains of birds and mammals (Hunt 2002; Watson 2002). For the purposes of this risk assessment, the bald eagle was assumed to eat a 100% piscivorous diet.

Estimated fresh food ingestion rates for bald eagles range from 0.248 to 0.700 kg/d (Chura and Stewart 1967; Stewart 1970; Duke 1976; Stalmaster 1981; Stalmaster 1982; Stalmaster and Gessaman 1984; Craig et al. 1988; O'Gara 1994). The highest value (0.700 kg/day) was used as a conservative estimate of food ingestion.

A water ingestion rate for bald eagle was not located in the literature. Therefore, the allometric equation developed by Calder and Braun (1983) was used to estimate the water ingestion rate, as follows: Water Ingestion (L/d) = $0.059 Wt^{0.67}$, where Wt is the weight in kg. Using the conservative BW of 3.63 kg, a water ingestion rate of 0.14 L/d was calculated.

An incidental sediment ingestion rate for the bald eagle was not located in the literature; therefore, a predicted incidental ingestion rate for sediment that may be entrained in the digestive system of prey items was used for this risk assessment. Consumption of prey items was assumed to be the primary mechanism by which a piscivorous bird such as the bald eagle may incidentally ingest sediment. In this model, the bluegill was used to represent fish eaten by the bald eagle.

Bluegills commonly reach a size of 12 oz (Pflieger 1975). From this, the amount of sediment entrained in fish 12 oz (0.340 kg) in weight was predicted. A study evaluating the stomach contents of 153 bluegills reported the diet to contain an average of 9.6% detritus (Kolehmainen 1974). A daily food ingestion rate of 1.75% of the BW per day has been reported for the bluegill (Kolehmainen 1974). From this, the amount of food consumed by a 0.340 kg bluegill is calculated to be 0.00595 kg/d. If the assumptions are made that 9.6% of the material ingested is sediment, and that the amount of sediment contained in the digestive system of a fish remains constant over time, it can be predicted that a fish of this size may contain 0.0005712 kg of sediment in its digestive system. This value (0.0005712 kg) was divided by the predicted fish BW (0.340 kg) to express the sediment entrained in the fish digestive systems as 0.00168 kg sediment per kg fish BW. When this value is multiplied by the conservative food ingestion rate of the bald eagle (0.700 kg/d), the predicted conservative sediment ingestion rate for a bald eagle consuming 100% fish is 0.00118 kg/d.

Home ranges values for the bald eagle vary from 400 to 6,392 ha (Haywood and Ohmhart 1983; Griffin and Baskett 1985; Gerrard 1992). The lowest value (400 ha) was used as a conservative estimate of HR size.

The average (1665 ha) was used as the representative estimate of HR size.

In summary, the food chain model parameters for the bald eagle are as follows:

Conservative estimates:

BW: 3.63 kg
²Total ingestion: 0.7 kg/d
¹Food ingestion: 0.69882 kg/d
 Water ingestion: 0.14 L/d
 Soil ingestion: 0.00118 kg/d
 HR size: 210 ha

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1.3 Wood Duck, (*Aix sponsa*): Omnivorous BirdLife History

Wood ducks (*Aix sponsa*) are small in size, measuring 43 to 51 cm. Male wood ducks exhibit greens, purples and blues with a white chin patch. They have red, long bills and long tails. Female wood ducks are grayish in color with a broad white eye-ring (Bull and Farrand 1977). The wood duck is a strictly North American species with two distinct populations; one on the east coast and a smaller population on the west coast. The wood duck winters as far north as Washington in the west and New Jersey in the east, but the winter range is primarily in the southern parts of its breeding range (Bent 1923).

Wood ducks require forested wetlands for both food and cover, although marshes are also used. Nesting and brooding habitat requires areas of flooded shrubs, trees, or both, or shrubs overhanging water will suffice. For example, border areas of brush are sufficient as are swampy areas with cypress and gum. The best habitat contains mast-producing hardwoods that border streams and permanent fresh-water lakes. Trees with nesting cavities and food near streams and fresh-water lakes are necessary for successful breeding (Jones *et al.* 1995). Wood ducks prefer sites with nest cavities within 0.5 km of water (Dugger and Fredrickson 1992).

Wood ducks are seasonally monogamous with courtship and pair formation beginning in the fall and continuing through winter. Both sexes can first breed as yearlings. After arrival on the breeding ground, females search for a suitable nest cavity. Wood duck females show exceptionally high fidelity to nesting areas and specific nest sites; they are likely to return to previous sites of successful nests (Hepp *et al.* 1987). Egg laying begins as early as January in the South, but may not begin until April in the northern part of the breeding range. The average clutch size is 12 eggs, ranging from 9 to 14 (Bellrose 1976). Larger clutches, sometimes with more than 30 eggs, are not uncommon in nest boxes. These clutches result from more than one female laying in the same nest, a behavior called "dump nesting". This behavior may be a response to competition for limited nest sites, or because wood ducks do not defend a territory during breeding. Incubation lasts 27 to 33 days. The young leave the nest the morning after hatching by jumping from the cavity to the ground; they do not return to the nest cavity (Terres 1980). Females tend their brood until the ducklings are three to five weeks old. Ducklings are able to fly by the age of eight or nine weeks. Wood ducks may renest after an early and successful nest, or if the first nest is disturbed (Palmer 1976).

The diet of a wood duck consists of mast (the fruit of trees and shrubs such as acorns, nuts, and berries), insects, aquatic invertebrates (molluscs and snails), aquatic plants, and seeds. Wood ducks feed primarily on plants during non-breeding season. Female wood ducks shift their diets to a high percentage of animal foods while breeding. Ducklings also consume a high percentage of animal foods, particularly during the first two weeks of life (Johnson 1971). Wood ducks are shallow water feeders; they obtain food primarily on or near the water surface. The optimum foraging depth is 8 to 45 cm (McGilvrey 1968). They also feed on land considerable distances from open water. Acorns are an important food item in the fall for wood ducks throughout their range (Delnicki and Reinecke 1986).

Because wood ducks are very mobile and migratory, it is difficult to define a home range. The average feeding radius is 25 - 30 miles every day. Annual migrations reach hundreds of miles (Jones *et al.* 1995).

Important predators of wood duck adults and ducklings include the great horned owl, mink, raccoon, fox, snapping turtle, and predacious fish such as northern pike and largemouth bass. Raccoons are important nest predators (McGilvrey 1968; Bull and Farrand 1977). Other factors that affect wood duck survival include development of forested wetland areas, cutting down nest trees, water level manipulations, and stream channelization that destroys overhanging cover (Funderburk *et al.* 1991). Average life expectancy after banding was 1.4 years for adult and 1.2 year for juveniles (McGilvrey 1969). Wood ducks have been documented to live as long as 16 years in the wild (Clapp *et al.* 1982).

Exposure Profile

Conservative exposure parameters reported here are the highest (ingestion rates) or lowest (BW, HR size) values located in the literature.

Adult wood ducks weigh 0.5 to 0.909 kg (Bellrose and Hawkins 1947; Nelson and Martin 1953; Drobney 1982; Delnicki and Reinecke 1986; Hepp *et al.* 1990; Blus *et al.* 1993; Hipes and Hepp 1995). Males tend to be heavier than females (Bellrose 1976). The lowest reported value (0.500 kg) will be used as a conservative measure of BW.

A food ingestion rate for this species could not be located in the literature. Using an allometric equation for omnivorous birds from Nagy (2001), a conservative food ingestion rate of 103 g/day (wet weight) was calculated for a 0.5 kg wood duck.

Although wood ducks feed primarily on plants during non-breeding season, animal foods are seasonally important, particularly for breeding females and ducklings. For this risk assessment, it was assumed that plants and invertebrates each comprised 50% of the wood ducks diet.

A water ingestion rate for the wood duck also could not be located in the literature. Using an allometric equation developed by Calder and Braun (1983), a water ingestion rate of 0.037 L/day was calculated for a 0.5 kg wood duck.

Mean and maximum sediment ingestion rates for wood ducks were reported by Beyer *et al.* (1997); these rates were less 2% and 6.3% of the dry diet, respectively. Using the food ingestion rate of 103 g/day calculated above, and the maximum sediment ingestion rate reported by Beyer *et al.* (1997), a sediment ingestion rate of 6.5 g/day was calculated.

No home range values were located for this species. For this risk assessment, an area use factor of one will be assumed.

In summary, the food chain model parameters for the wood duck are as follows:

Conservative Scenario:

BW:	0.500 kg
Food ingestion:	0.103 kg wet weight
Water ingestion:	0.037 L/day
Soil ingestion:	0.0065 kg/day

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1.4 American Robin, (*Turdus migratorius*): Insectivorous Bird

Life History

The American robin (*Turdus migratorius*) occurs throughout most of the continental United States and Canada, wintering in the southern half of North America and into Central America (Bull and Farrand 1977; Peterson 1990). Given the increase in open habitat and lawns, the robin's breeding range has expanded in recent times (Collins and Boyaijan 1965; Ehrlich *et al.* 1988). Habitat requirements for breeding robins include access to fresh water, protected nesting sites, and productive foraging areas (Howell 1942; Ehrlich *et al.* 1988). These requirements are commonly met in moist forests, swamps, open woodlands, and other open areas (Bull and Farrand 1977). Non-breeding robins occupy similar habitats, although proximity to fruit bearing trees is of more importance.

Male robins are characterized by a dark grey to black head and back with a bright red to orange breast. Females and juveniles are similar to males in appearance but much duller in coloring, and juveniles have black spots on their breasts. The largest of the North American thrushes, both males and female robins grow to 9 to 11 inches long. Robin legs are classified as booted tarsi, a long leg with few scales (Collins and Boyaijan 1965).

The primary foraging technique for robins is to hop along the ground in search of ground-dwelling invertebrates, although they commonly search for insects and fruit in tree branches as well. The robin's diet during the breeding season consists mainly of invertebrates and some fruit, but fruit is the primary food consumed outside of the breeding season. Robins exhibit a low digestive efficiency for fruit, and they often consume more than their own BW in fruit to meet their metabolic needs (Hazelton *et al.* 1984).

The diet of the American robin consists of seasonally variable proportions of invertebrates (e.g., earthworms, snails, beetles, caterpillars, spiders) and fruit (e.g., dogwood, cherry, sumac, holly, hackberries, and junberries) (Martin *et al.* 1951; Paszkowski 1982; Wheelwright 1986; Ehrlich *et al.* 1988). The ratio of % invertebrates to % fruit in the diet is reported to change from 94:6 in spring (nesting season) to 34:66 in summer to 4:96 in fall (migratory season) to 7:93 in winter (Wheelwright 1986). Year round, the diet of the robin averages 63% fruits and 37% invertebrates (Martin *et al.* 1951; Eiserer 1976; Wheelwright 1988). Robin diets are diverse; analysis of the stomach contents of 1900 robins showed that the birds consumed fruit from more than 50 plant genera and invertebrates from over 100 families (Wheelwright 1986).

Robins typically use the same foraging site for many weeks at a time but join a variety of roosts, usually within 2 km of the foraging area (Morrison and Caccamise 1990). During the breeding periods, male robins establish territories, the size of which is determined by population density: smaller territories are found where robin densities are high. Most foraging occurs within these territories; however, if food resources are limited, adult robins will leave temporarily to forage elsewhere. Breeding territories are vigorously defended; robins will attack man, snake or other enemies to defend its territory or nest, except in more remote locations (Howell 1942; Collins and Boyaijan 1965). Females lay eggs in nests made of mud, grass, and twigs, built 0.9 to 7.5 meters above the ground in trees, buildings, or shrubs. Eggs are characteristically bright blue, number from 3 to 6, and hatch in 12 to 14 days. Young juveniles leave two weeks after hatching and can live up to ten years in the wild, though most rarely survive past 14 months (Collins and Boyaijan 1965; Cassidy 1990).

Predators that feed on adult robins include cats, dogs, owls, and hawks. Crows, jays, grackles, snakes and squirrels are nest predators, attacking both eggs and nestlings. A robin that survives to adulthood has a life expectancy of 10 years (Eiserer 1976; Wauer 1999).

Exposure Profile

Conservative exposure parameters reported here are the highest (ingestion rates) or lowest (BW, HR size) values located in the literature.

Adult American robins weigh from 0.055 to 0.103 kg (Eiserer 1976; Clench and Leberman 1978; Hazelton *et al.* 1984; Skorupa and Hothem 1985; Wheelwright 1986; Wheelwright 1988; Wauer 1999). The lowest value (0.055 kg) was used as a conservative measure of BW; the average value (0.0771 kg) was used as a representative measure of BW.

The diet of the American robin primarily consists of fruit and invertebrates. Diet varies seasonally, and depends on habitat and time of day (Wheelwright 1988). The year-round diet is comprised of 37% invertebrates and 63% fruits (Martin *et al.* 1951; Eiserer 1976; Wheelwright 1988). For this risk assessment, however, the diet of the American robin was assumed to consist solely of invertebrates.

Food ingestion rates (FIR) for adult robins are highly dependant on whether fruits or invertebrate prey are consumed. Several studies were located that reported daily fresh fruit ingestion rates ranging from 0.0571 kilograms per day (kg/d) to 0.1078 kg/d (Hazelton *et al.* 1984; Tobin 1984; Skorupa and Hothem 1985; Levey and Karasov 1989), with the average being 0.0753 kg/d. Only one study was located that reported a food ingestion rate for robins feeding on invertebrates; Levey and Karasov (1989) reported an ingestion rate of 0.024 kg/d for robins consuming crickets. In this risk assessment, assuming a diet consisting solely of invertebrates, robins consume 0.024 kg/d under both a conservative and representative scenario.

A species-specific water ingestion rate could not be located for the robin. Water ingestion rates were calculated using the allometric equation developed by Calder and Braun (1983): $WI (L/d) = 0.059 Wt^{0.67}$, where WI is the daily water ingestion rate and Wt is the BW in kg. Using the above BW, a conservative water ingestion rate of 0.0085 L/d was calculated.

Soil ingestion for the American robin was derived from calculated values determined by (Beyer *et al.* 1994) for the American woodcock. Given that the diets of the woodcock and robin are similar, soil ingestion by the robin can be expected to be 10.4% of the diet. For robins eating only invertebrates, the soil ingestion rate of 10.4% was multiplied by the food ingestion rate of 0.024 kg/d to yield soil ingestion estimates of 0.0025 kg/d.

The reported HR size of the American robin ranges from 0.11 hectares (ha) to 0.42 ha (Howell 1942; Eiserer 1976; Stokes 1979; Pitts 1984; Wauer 1999). The smallest value (0.11 ha) was used as a conservative estimate of HR size; the average value (0.214 ha) was used as a representative estimate of HR size.

In summary, the food chain model parameters for the American robin are:

Conservative Scenario:

BW:	0.055 kg
³ Total ingestion:	
100% invert	0.024 kg/d

³The total ingestion rate is the measured (laboratory or field) food ingestion rate cited in the paragraph in the exposure profile. Soil ingestion is generally measured as a percent of food ingestion. Therefore, the food ingestion rate used in the food chain models is considered to be equal to the total ingestion rate (listed above) minus the soil ingestion rate.

Food ingestion:	
100% invert	0.0215 kg/d
Water ingestion:	0.0085 L/d
Soil ingestion:	10.4%
100% invert	0.0025 kg/d
HR:	0.11 ha

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2.0 MAMMALIAN COMMUNITY

2.1 Mink, (*Mustela vison*): Piscivorous Mammal

Life History

Mink are distributed over much of boreal North America, southward throughout the eastern United States and in the west to California, New Mexico, and Texas (Jones and Birney 1988). They can be found in virtually any habitat containing permanent water; they are not commonly found in upland areas (Jones and Birney 1988). Although primarily nocturnal, their activity often extends into midday (Hoffmeister 1989).

Mink are characterized by dark chestnut brown fur with tails comprising one-third to one-half of their 46 to 70 cm length. The coat is thick and dense, with an oily underfur overlaid by long and coarse guard hairs. Males of the species are up to twice the weight of females. A long neck and thin body are supported by short sturdy legs. An occasional white spot appears on the undersides of the animals, and the ears are short and rounded, lying close to the head. The feet have five webbed toes used for swimming and capturing fish, and anal scent glands are well-developed (Godin 1977; Linscombe *et al.* 1982).

Dens are always near water, usually either in an old muskrat burrow or constructed by the mink itself (Jones and Birney 1988). Males tend to live in their own burrows that are less elaborate than ones occupied by females (Barbour and Davis 1974). The mink is a constant wanderer, and home ranges tend to be linear since mink often follow a shoreline (Jones and Birney 1988). Mink are solitary and mark their territories by spraying (Merritt 1987).

Seasonal food availability governs the mink dietary composition (Barbour and Davis 1974). Their diets may consist of crayfish, muskrats, frogs, fish, snakes, rodents, rabbits, and plants, among other items (Schwartz and Schwartz 1981; Jones and Birney 1988). Crayfish and muskrats are a major portion of the summer diet in many regions of North America (Barbour and Davis 1974; Merritt 1987; Jones and Birney 1988). Larger prey are killed by being bitten on the neck. Females have a difficult time handling larger prey such as muskrats, and their diet is usually more limited.

Breeding occurs from January to early April with gestation periods ranging from 40 to 75 days (Schwartz and Schwartz 1981; Merritt 1987). A single litter highly variable in size (consisting of from 1 to 17 young) may be produced (Schwartz and Schwartz 1981). Average litter sizes vary among regions (Barbour and Davis 1974; Schwartz and Schwartz 1981; Merritt 1987; Jones and Birney 1988; Hoffmeister 1989). Young are weaned at about five to six weeks of age, leave the nest at six to eight weeks, and are sexually mature by ten months (Schwartz and Schwartz 1981; Merritt 1987).

The mink has several predators. Great horned owls, foxes, coyotes, bobcats, and dogs are known to prey on mink (Schwartz and Schwartz 1981; Merritt 1987). There have been records of some mink individuals living up to six years, but mink seldom exceed two years of age in the wild (Schwartz and Schwartz 1981).

Exposure Profile

For the purpose of this risk assessment, conservative exposure parameters are the highest (ingestion rates) or lowest (BW, HR size) values located in the literature.

Adult mink weigh from 0.454 to 2.31 kg (Jackson 1961; Mitchell 1961; Soper 1973; Barbour and Davis 1974; Alexander 1977; Godin 1977; Sealander 1979; Bleavins and Aulerich 1981; Rue 1981; Schwartz and Schwartz 1981; Linscombe *et al.* 1982; Mumford and Whitaker 1982; Askins and Chapman 1983; Baker 1983; Hornshaw *et al.* 1983; Merritt 1987; Jones and Birney 1988; Nowak 1991). The lowest body weight of 0.454 kg was used for the conservative exposure profile.

Mink are opportunistic predators that hunt principally along shorelines and emergent vegetation (U.S. EPA 1993). Seasonal availability and regional preferences govern the primary constituents of the mink's diet. Mammals and crayfish are usually the most abundant prey items, but fish, amphibians, and young birds are also taken (Linscombe *et al.* 1982; Merritt 1987). Overall, the dietary composition of the mink consists of 52 percent (%) fish, 38% small mammals and birds, 5% crustaceans, 2% amphibians, 0.5% insects, 0.5% vegetation, and 3% other or unidentified matter (Korschgen 1952; Alexander 1977; Rue 1981). For this risk assessment, mink are assumed to be 100% piscivorous.

Food ingestion rates have been measured in several studies (Bleavins and Aulerich 1981; Aulerich *et al.* 1986; Heaton *et al.* 1995). Reported food ingestion rates range from 0.129 to 0.409 kg/day. A conservative food ingestion rate of 0.409 g/day was used for this risk assessment.

A water ingestion rate of 0.133 milliliters per gram BW per day (ml/g BW/day) was reported for adult female farm-raised mink (Farrel and Wood 1968). This value was converted to water ingestion rates in units of liters per day (L/d) by multiplying by the BWs above, yielding conservative and representative water ingestion rates of 0.0604 L/d.

An incidental sediment ingestion rate for the mink was not located in the literature; therefore, a predicted incidental ingestion rate for sediment that may be entrained in the digestive system of prey items was used for this risk assessment. Fish are one of the primary food sources for the mink; consumption of prey items containing sediment is assumed to be the primary mechanism by which a piscivorous mammal such as the mink would ingest sediment. In this model, the bluegill (*Lepomis machrochirus*) was used to represent fish eaten by the mink.

Bluegills commonly reach a size of 12 ounces (oz) (Pflieger 1975). From this, the amount of sediment entrained in fish 12 oz (0.340 kg) in weight was predicted. A study evaluating the stomach contents of 153 bluegills reported the diet to contain an average of 9.6% detritus (Kolehmainen 1974). A daily food ingestion rate of 1.75% of the BW per day has been reported for the bluegill (Kolehmainen 1974). From this, the amount of food consumed by a 0.340 kg bluegill is calculated to be 0.00595 kg/d. If the assumptions are made that 9.6% of the material ingested is sediment, and that the amount of sediment contained in the digestive system of a fish remains constant over time, it can be predicted that a fish of this size may contain 0.0005712 kg of sediment in its digestive system. This value (0.0005712 kg) was divided by the predicted fish BW (0.340 kg) to express the sediment entrained in the fish digestive systems as 0.00168 kg sediment per kg fish BW. When this value is multiplied by the conservative food ingestion rate of the mink (0.409 kg/d), the predicted sediment ingestion rate for mink consuming 100% fish approximately 0.000687 kg/d.

Reported HR sizes vary from 7.8 to 770 hectares (ha) (Mitchell 1961; Arnold and Fritzell 1987; Merritt

1987; Nowak 1991). A value of 7.8 ha was used as the conservative estimate for HR size, and an average value of 137 ha was used as the representative estimate of HR size (Merritt 1987).

In summary, the food chain model parameters for the mink are as follows:

Conservative estimates:

Body weight:	0.454 kg
⁴ Total ingestion:	0.409 kg/d
¹ Food ingestion:	0.408313 kg/d
Water ingestion:	0.0604 L/d
Sediment ingestion:	0.000687 kg/d
Home range size:	7.8 ha

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⁴The total ingestion rate is the measured (laboratory or field) food ingestion rate cited in the paragraph in the exposure profile. Soil ingestion is generally measured as a percent of food ingestion. Therefore, the food ingestion rate used in the food chain models is considered to be equal to the total ingestion rate (listed above) minus the soil ingestion rate.

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2.2 Raccoon, (*Procyon lotor*): Omnivorous Mammal

Life History

The raccoon is the most abundant and widespread omnivore in North America. Measuring in total length from 60 to 105 centimeters (cm) including a 20 to 40 cm tail, raccoons are characterized by a stout body and a black mask across the eyes and cheeks. The body fur is long, fine, thick, and grizzled in appearance. Fur ranges from a dull gray to a medium brown, and the tail is ringed with black and white stripes. The face is

whitish, and is framed by a grayish head and white-edged ears. Their long, flexible fingers are opposable to some degree and capable of delicate manipulations (Kaufmann 1982).

Raccoons are mostly nocturnal mammals inhabiting wooded areas near water, marshes, suburban areas, or virtually any place that can provide food, a den, and permanent water (Jones and Birney 1988; Hoffmeister 1989). Their dens are usually within 1,200 feet from a water supply but are situated in an area where the den can remain dry (Hoffmeister 1989). Dens may be in hollow trees, burrows, caves, crevices in rock, haystacks, chimneys, or under logs (Schwartz and Schwartz 1981; Hoffmeister 1989). During periods of heavy snow or ice, raccoons will den together for several days (Schwartz and Schwartz 1981); otherwise, they are normally solitary and remain active throughout the year (Jones and Birney 1988).

Raccoons are opportunistic omnivores, consuming various food items such as berries, fruit, nuts, corn, seeds, aquatic and terrestrial invertebrates, eggs, frogs, snakes, fish, muskrats, and young waterfowl (Schwartz and Schwartz 1981; Jones and Birney 1988). Seasonal and local food availability appears to dictate dietary composition, although as a general rule, plant matter comprises a greater portion of the diet than does animal matter (Barbour and Davis 1974). Animal matter consumption is greatest during spring, with crayfish being the most important food item (Kaufmann 1982).

Males may mate with several females during the breeding season. Breeding may occur from December through July, although most breeding occurs from January to March (Schwartz and Schwartz 1981; Jones and Birney 1988). About 40 percent (%) of females breed the spring following their birth; the remainder do not breed until their second year. Males are capable of breeding the spring following their birth, but probably have little opportunity (Schwartz and Schwartz 1981). Gestation lasts for approximately 63 days with litter sizes ranging from two to seven young, the usual number being four (Jackson 1961; Barbour and Davis 1974). The young are weaned at 10 to 12 weeks and forage with the mother well into the autumn.

Raccoons maintain fairly well-defined areas of activity (home ranges [HR]), but they do not actively defend territories (Stuewer 1943). Although they are solitary animals, raccoons will utilize areas that are also used at other times by other raccoons (their activity ranges may overlap; Stuewer 1943). Because they are omnivorous, raccoons are not as mobile as similar-sized carnivores. When food supplies and other habitat requirements are optimum, raccoons tend to have smaller HR sizes than when such environmental factors are limited (Baker 1983). Males generally have larger HR sizes than females.

Natural predators of the raccoon include owls, hawks, bobcats, coyotes (Schwartz and Schwartz 1981; Merritt 1987). Hunting and trapping by humans is a major source of mortality (Jackson 1961). Starvation and malnutrition can be a factor in late winter and early spring, especially for juveniles. Raccoons are susceptible to several diseases, including dog distemper, rabies, and raccoon encephalitis. Most raccoons in the wild live less than 5 years, but some may live 10 or 12 years. Raccoons in captivity have lived up to 17 years (Jackson 1961; Schwartz and Schwartz 1981).

Exposure Profile

For this risk assessment, conservative exposure parameters are the highest (ingestion rates) or lowest (body weight [BW], HR size) values located in the literature.

Adult BWs vary with location, age, and sex. Males are generally 10% larger than females (Baker 1983), and northern raccoons are generally larger than southern raccoons (Kaufmann 1982). Body weights of yearlings may overlap with adult body weights (Scheffer 1950). Body weights of adult raccoons range from 2.2 to 15 kg (Stuewer 1943; Scheffer 1950; Schoonover 1950; Cabalka *et al.* 1953; Marshall 1956; Kinard 1964; Wood and Odum 1964; Barbour and Davis 1974; Alexander 1977; Lehman 1977; Hardin 1978; Sealander 1979; McComb 1981; Sanderson and Hubert 1981; Schwartz and Schwartz 1981; Mumford and Whitaker 1982; Baker 1983; Moore 1983; Merritt 1987; Jones and Birney 1988). A conservative BW of 2.2 kg was used in this risk assessment.

The raccoon is an opportunistic feeder; seasonal and local food availability determines dietary composition. Based on review of numerous food habit studies (Dearborn 1932; Hamilton 1936; Giles 1939; Giles 1940; Hamilton 1940; Stuewer 1943; Yeager and Rennels 1943; Baker *et al.* 1945; Yeager and Elder 1945; Schoonover 1950; Tyson 1950; Hamilton 1951; Schoonover and Marshall 1951; Llewellyn and Uhler 1952; Cabalka *et al.* 1953; Tester 1953; Dorney 1954; Wood 1954; Stains 1956; Johnson 1970; Cowan 1973; Alexander 1977; McComb 1981; Mumford and Whitaker 1982; Tabatabai and Kennedy 1988), the average year round diet of the raccoon is comprised of 61% plant foods and 35% animal foods⁵. The percentage of the diet comprised of plant food was higher every season except spring, when 38% of the diet was made up of plant foods and 57% was comprised of animal foods. Corn and fruit were the most important plant food items, and crayfish was the most important animal food item. For this risk assessment, the raccoon was considered an omnivore that consumes a diet comprised of 50% plant matter and 50% animal matter.

Fresh food ingestion rates of captive raccoons were reported by Teubner and Barrett (1983) and Conover (1989). When necessary, values were derived from dry food ingestion rates using the water content of the diet (U.S. EPA 1993). The resulting ingestion rates range from 0.303 kilograms per day (kg/d) to 0.400 kg/d. A conservative food ingestion rate of 0.400 kg/d will be used for this risk assessment.

A species specific water ingestion rate could not be located for the raccoon. Water ingestion rates were calculated using the allometric equation developed by Calder and Braun (1983): $WI \text{ (liters per day [L/d])} = 0.099 Wt^{0.90}$, where WI is the daily water ingestion rate and Wt is the BW in kg. Using the above body weight, a conservative water ingestion rate of 0.201 L/d was calculated.

Soil ingestion rates ranging from 0.2 to 9.4 % of the diet have been reported for this species (Yeager and Elder 1945; Schoonover 1950; Cowan 1973; Beyer *et al.* 1994). A conservative soil/sediment ingestion rate of 9.4% was used. Using the above food ingestion rates, a conservative soil ingestion rate of 0.0376 kg/d was calculated.

Home range sizes ranging from 4.71 to 814.6 hectares (ha) have been reported for adult raccoons (Stuewer 1943; Schoonover 1950; Ellis 1964; Urban 1970; Cowan 1973; Lehman 1977; Sherfy and Chapman 1980; Moore 1983). Males generally have larger HRs than females. Home range size is also affected by habitat quality; in good habitat, HRs tend to be smaller. A conservative HR size of 4.71 ha and a representative HR size of 133.3 ha were used for this risk assessment.

In summary, the food chain model parameters for the raccoon are as follows:

Conservative Scenario:

BW:	2.2 kg
⁶ Total ingestion:	0.4 kg/d
² Food ingestion:	0.3624 kg/d
Water ingestion:	0.201 L/d
Soil ingestion:	0.0376 kg/d
HR:	4.71 ha

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⁵Dietary composition numbers do not add up to 100%. Several studies reviewed did not report dietary composition numbers that added up to 100%.

⁶The total ingestion rate is the measured (laboratory or field) food ingestion rate cited in the paragraph in the exposure profile. Soil ingestion is generally measured as a percent of food ingestion. Therefore, the food ingestion rate used in the food chain models is considered to be equal to the total ingestion rate (listed above) minus the soil ingestion rate.

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2.3 Short-tailed Shrew, (*Blarina brevicauda*): Insectivorous Mammal

The short-tailed shrew is common throughout the eastern and central portions of the United States (Jones and Birney 1988, Barbour and Davis 1974). It is a large, heavy-bodied, and extremely active shrew, dark gray in color, with a short tail, pointed nose, and tiny eyes (Merritt 1987). It occupies a variety of moist and dry habitats such as marshes, bogs, forest floors with ample decaying matter, brushland, fencerows, weedfields, and pastures (Barbour and Davis 1974; Merritt 1987; Jones and Birney 1988).

The home range of the short-tailed shrew varies with population density. In peak years, density may be greater than 25 individuals per acre (Schwartz and Schwartz 1981), while in other years, density may be only one individual per acre (Merritt 1987). Usually, home ranges are between 0.5 to 1 acre in size, though they can sometimes be up to 4.5 acres (Blair 1940; Blair 1940; Burt 1940; Fitch 1958; Buckner 1966; Platt 1976; Schwartz and Schwartz 1981; Merritt 1987). Using echolocation and scent-marking, short-tailed shrews rely heavily on their hearing and sense of smell to locate food and to move about (Schwartz and Schwartz 1981; Hoffmeister 1989). They are active both day and night, usually throughout the year, although they may undergo a period of torpor during harsh winters (Hoffmeister 1989). They rest a

considerable portion of each day, being active only 7-16 percent of the time, and most of their activity is subnivean (Merritt 1987). They construct elaborate systems of runways and tunnels at or near the ground surface, or use tunnels left by other species such as moles or voles (Merritt 1987). Tunnel systems include caching sites and dedicated latrines (Merritt 1987). Two types of nests are built by short-tailed shrews, a breeding nest and a resting nest. Both are built underground beneath a log, rock, or other cover and have multiple entrances. The breeding nest is typically larger than the resting nest (Merritt 1987).

Although short-tailed shrews strongly prefer to eat animal matter, they are opportunistic omnivores and will voraciously consume whatever food items are available, including earthworms, slugs, snails, arthropods, fungi, roots, fruits, seeds, snakes, salamanders, small mammals, and young birds (Barbour and Davis 1974; Jones and Birney 1988; Schwartz and Schwartz 1981). Plant matter is generally consumed to a greater extent in winter, and in some regions may constitute up to 25 percent of the shrew's diet (Schwartz and Schwartz 1981; Hamilton 1930; Barbour and Davis 1974). Prey items that are not consumed immediately are stored in a cache (Merritt 1987). The saliva of short-tailed shrews contains a toxin that allows shrews to paralyze their prey and cache it for later consumption; in this manner, fresh food is available for longer periods of time between hunting bouts (Merritt 1986).

The annual breeding period of the short-tailed shrew begins in early spring and extends into the fall, although in some regions, breeding may subside in early and midsummer but peak again in early fall (Hoffmeister 1989, Jones and Birney 1988). Females have from one to three litters per year (Schwartz and Schwartz 1981, Merritt 1987). Gestation periods are approximately 21 to 22 days and litters contain three to ten (average 5-7) young (Jones and Birney 1988, Schwartz and Schwartz 1981). The young are fully mature at about three months of age, and both sexes may breed their first spring (Schwartz and Schwartz 1981, Jones and Birney 1988, Barbour and Davis 1974, Merritt 1987).

Natural predators of the short-tailed shrew include fish, snakes, owls, hawks, shrikes, opossums, raccoons, foxes, coyotes, weasels, bobcats, skunks, and domestic cats, although many of these predators do not consume the shrew (or at least all of the shrew) because of its distasteful musk glands (Barbour and Davis 1974, Merritt 1987, Schwartz and Schwartz 1981). The life expectancy of a short-tailed shrew in the wild is approximately one to two years (Schwartz and Schwartz 1981, Merritt 1987).

Exposure Profile

Adult short-tailed shrews weigh from 12.5 to 22.5 g (U.S. EPA 1993). A conservative body weight of 12.5 g will be used for this risk assessment.

Food ingestion rates ranging from 0.49 to 0.62 g/g BW/day have been reported (U.S. EPA 1993). A conservative food ingestion rate of 0.62 g/gBW/day (7.8 g/day) will be used for this risk assessment.

Because short-tailed shrews are primarily carnivorous, a diet comprised of 100% invertebrates will be assumed for risk calculations for this species.

A water ingestion rate of 0.223 g/g BW/day has been reported for short-tailed shrews (U.S. EPA 1993). To express this value in units of ml/day, the water ingestion rate was multiplied by the conservative body weight cited above to yield a conservative water ingestion rates of 2.8 mL/day.

Home range sizes from less than 0.03 ha to 1.8 ha have been reported for this species (U.S. EPA 1993). A conservative home range size of 0.03 ha and a representative home range size of 0.4 ha will be used in risk calculations for this species.

A soil ingestion rate for the short-tailed shrew was not available from the literature, therefore, the soil ingestion rate of the opossum was used. The opossum's diet is similar to that of the short-tailed shrew since they are both opportunistic omnivores with a strong preference for animal matter (Schwartz and Schwartz

1981). A soil ingestion rate of 9.4 percent of the diet was reported for the opossum (Beyer *et al.* 1994). This value was multiplied by the conservative food ingestion rates (7.8 g/day) to yield a soil ingestion rate of 0.7 g/day.

Conservative Scenario:

BW:	0.0125 kg
Food ingestion:	0.0078 kg/d
Water ingestion:	0.0028 L/d
Soil ingestion:	0.0007 kg/d
HR:	0.03 ha

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2.4 Muskrat, (*Ondatra zibethicus*): Herbivorous Mammal

Life History

The muskrat is a large, semi-aquatic mammal with rich brown dorsal fur overlain with long guard hairs, a scaly tail, and partly webbed hind feet. It lives virtually anywhere where sufficient food and permanent water is present, including saltwater marshes (Schwartz and Schwartz 1981; Jones and Birney 1988). It can be found throughout most of the U.S., with the exception of Hawaii, Florida, south Texas, and parts of California (Merritt 1987; Schwartz and Schwartz 1981).

Musk rats are primarily nocturnal and are active throughout the year (Merritt 1987). Home range [HR] sizes vary from 10 to 180 meters' length of shoreline, depending on the size and shape of the water in which the animals live (Merritt 1987), or from 0.0484 hectare (ha) to 0.39 ha (Neal 1968; Proulx and Gilbert 1983). The home of a muskrat consists of a system of burrows dug into a bank and leading to underwater and above water openings, or a conical lodge comprised of a heap of vegetation and mud (Merritt 1987; Jones and Birney 1981). Each home is usually inhabited by several muskrats, most often members of the same family (Davis and Schmidly 1994). On occasion, other animals such as birds, reptiles, and amphibians may utilize these dens and lodges, even when muskrats are present (Schwartz and Schwartz 1981).

The breeding season of the muskrat varies with regional climate, with northern animals usually producing three to four litters per year and southern animals breeding year-round (Jones and Birney 1988). Gestation periods range from 22 to 31 days, and litters contain from 1 to 16 (averaging 3-8) individuals (Barbour and Davis 1974; Schwartz and Schwartz 1981). Litter sizes are larger in the north, where the average size is 7-8, compared with 6 or less in the south and central portions of the country (Barbour and Davis 1974). Weaning occurs between three and four weeks of age (Schwartz and Schwartz 1981). Sexual maturity is reached in 10 to 12 months (Davis and Schmidly 1994).

Although they may consume meat (including carrion) during times of food scarcity, muskrats are generally herbivorous (Davis and Schmidly 1994; Schwartz and Schwartz 1981). Aquatic vegetation, such as cattails, algae, and sedges, appears to be the favored food item (Davis and Schmidly 1994). Terrestrial vegetation, aquatic invertebrates, fish, frogs, clams, snails, reptiles, young birds, and other muskrats have also been reported to be consumed by muskrats (Jones and Birney 1988; Barbour and Davis 1974; Davis and Schmidly 1994; Schwartz and Schwartz 1981).

The mink is usually the main natural predator of muskrats in most areas (Barbour and Davis 1974; Jones and Birney 1988; Schwartz and Schwartz 1981). Raptors, owls, coyotes, foxes, dogs, cats, raccoons, weasels, large snakes, snapping turtles, and fish also prey on muskrats (Schwartz and Schwartz 1981). Muskrats also carry a heavy parasitic load and as a result may suffer population crashes (Jones and Birney 1988). Only about one-third of young muskrats survive to their first winter (Schwartz and Schwartz 1981). One tagged muskrat was reported to survive for four years in the wild (Schwartz and Schwartz 1981).

Exposure Profile

For the purpose of this risk assessment, conservative exposure parameters are the highest (ingestion rates) or lowest (body weight [BW], HR size) values located in the literature.

Adult muskrats weigh from 0.541 kg to 1.814 kg, with the average being 1.191 kg (Dozier 1948; Beer and Meyer 1951; Fuller 1951; Stevens 1953; Reeves and Williams 1956; Wilson 1956; Donohoe 1961; Erickson 1963; Neal 1968; Soper 1973; Barbour and Davis 1974; Schacher and Pelton 1978; Parker and Maxwell 1980; McDonnell and Gilbert 1981; Schwartz and Schwartz 1981; Mumford and Whitaker 1982; Baker 1983; Parker and Maxwell 1984; Merritt 1987; Jones and Birney 1988; Davis and Schmidly 1994). Males are generally larger than females: males average 1.212 kg and females 1.178 kg. There is also regional variation in muskrat body size: muskrats are usually heavier in northern latitudes, although the smallest body sizes are found in Idaho (Reeves and Williams 1956). A conservative BW of 0.541 kg was used for this risk assessment.

Muskrats are primarily herbivorous, though they will eat animal matter on occasion (Jones and Birney 1988; Barbour and Davis 1974; Davis and Schmidly 1994; Schwartz and Schwartz 1981). Muskrats generally eat different plant foods in proportion to their availability in the habitat (Takos 1947). Often, one or two food items, the selection of which varies with habitat, will comprise 70-80 percent (%) of the diet. The diet of muskrats in Maryland was found to consist of approximately 50% green algae, 46% other green vegetation (primarily cattails, other rushes, and sedges), 3% corn, millet, and other seeds, and 1% other items (Willner et al. 1975). In other regions, cattails are reported to be the mainstay of the muskrat diet (Davis and Schmidly 1994; Schwartz and Schwartz 1981). For this risk assessment, muskrats were assumed to be entirely herbivorous.

Food ingestion rates measured for the muskrat range from 0.250 kilograms per day (kg/d) to 0.289 kg/day (Svihla and Svihla 1931). The highest value was used as a conservative estimate of food ingestion.

Water ingestion rates were calculated using the allometric equation developed by Calder and Braun (1983): $WI \text{ (liters per day [L/d])} = 0.099 Wt^{0.90}$, where WI is the daily water ingestion rate and Wt is the body weight in kg. Using the above body weights, a conservative water ingestion rate of 0.057 L/d was calculated.

for this risk assessment.

A soil ingestion estimate for the muskrat could not be found in the literature; however, Willner *et al.* (1975) reported that, on average, 1% of the muskrat diet was composed of material other than vegetation. This value will be assumed to represent the percentage of soil ingested by the muskrat. This value was multiplied by the conservative food ingestion rate for the muskrat to yield a soil ingestion rates of 0.00289 kg/d.

Muskrat HR sizes have been reported to vary from 0.0484 ha to 0.39 ha (Neal 1968; Proulx and Gilbert 1983).

In summary, the food chain model parameters for the muskrat are as follows:

Conservative estimates:

BW:	0.541 kg
⁷ Total ingestion:	0.289 kg/d
¹ Food ingestion:	0.28611 kg/d
Water ingestion:	0.057 L/day
Soil ingestion:	1% or 0.00289 kg/d
HR size:	0.0484 ha

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⁷The total ingestion rate is the measured (laboratory or field) food ingestion rate cited in the paragraph in the exposure profile. Soil ingestion is generally measured as a percent of food ingestion. Therefore, the food ingestion rate used in the food chain models is considered to be equal to the total ingestion rate (listed above) minus the soil ingestion rate.

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NOTICE OF PUBLIC AVAILABILITY

The United States Environmental Protection Agency (EPA) announces the availability for public review of files comprising the administrative record for the selection of the removal action at the Matteo Iron and Metal Site, located at 1708 Route 130, West Deptford Township, Gloucester County, New Jersey. The EPA seeks to inform the public of the availability of the record file at this repository and to encourage the public to comment on documents as they are placed in the record file.

The administrative record file includes documents which form the basis for the selection of a removal action at this site. Documents now in the record file include: Action Memorandum, Sampling Plan, Trip Reports, and the EPA regional guidance documents list. Other documents may be added to the record files as they become available. These additional documents may include, but are not limited to, other technical reports, validated sampling data, comments, and new data submitted by interested persons, and the EPA responses to significant comments.

The administrative record files are available for review during normal business hours at:

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Removal Action Branch
2890 Woodbridge Avenue
Edison, NJ 08837
(732) 906-6930

Additional guidance documents and technical literature is available at the following location:

U.S. EPA - Region II
Removal Records Center
2890 Woodbridge Avenue
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Written comments on the Administrative Record should be sent to:

Nick Magriples
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RELEASE: April 22, 2005

Codey, DEP Launch Plan to Speed Cleanup of 10 Contaminated Sites Along Delaware River

(WEST DEPTFORD) – Acting Governor Richard J. Codey today announced a new effort to speed the cleanup of 10 major contaminated sites along the Delaware River. The effort includes a no-tolerance policy for delays by companies responsible for cleaning contaminated sites, and the use of tough enforcement tools.

“Historically we have approached contaminated sites as individual cases, instead of identifying specific regions of New Jersey that need to be protected,” Codey said. “But a regional approach will create better results for the environment. It will let us focus on the sites that will have the greatest impact on a region’s well being.

“Our plan for the Delaware River will focus on zero tolerance for delays,” the Acting Governor continued. “We are saying ‘Time’s up’ for cleanups that are behind schedule.”

The initiative, launched by Codey and the New Jersey Department of Environmental Protection, represents a new region-based approach to clean up contaminated sites. The 10 sites targeted in this initiative will have the greatest immediate impact on improving the quality of the Delaware River. The sites border the river in Camden, Gloucester and Salem counties.

“Enough is enough on slow cleanups where contamination threatens the Delaware River,” said DEP Commissioner Bradley M. Campbell. “As shad make their way up this majestic waterway to spawn, we need to maintain our resolve to eliminate potential pollution sources at these sites. The Delaware not only serves as a drinking water supply for thousands of New Jersey residents, it also provides great recreation for anglers and boaters.”

Codey and Campbell announced the initiative today during a press conference at RiverWinds Community Center in West Deptford. Also present was Delaware River Basin Commission Executive Director Carol R. Collier.

“The Delaware River Basin Commission fully supports this proactive, region-based

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approach by New Jersey to protect the river," DRBC Executive Director Collier said. "This will certainly assist the multi-state efforts led by the commission to reduce the level of toxics in the tidal river below Trenton."

Under this initiative:

- If companies fail to live up to their cleanup agreements, the DEP will terminate those agreements, issue possible fines, and issue specific cleanup directives.
- If companies still refuse to cooperate and the DEP has to take over cleanup duties with public funds, the state will pursue those companies for triple the amount that is spent in state funds.
- The DEP will penalize companies that do cleanup work that turns out to be unacceptable.
- For sites where the responsible parties are cooperating, the DEP will make sure the work gets done as quickly as possible.
- In cases where the companies responsible have gone bankrupt, the DEP will work to quickly clean those sites using state brownfields and other cleanup funds.

"We have already told ExxonMobil they are moving too slowly to clean up a Delaware River site they are responsible for in Gloucester County. We have terminated our voluntary agreement with them and have directed them to sign a new, enforceable timeline, or face penalties as high as \$50,000 per violation per day," Codey said.

In September the DEP launched a similar region-based effort targeting contaminated sites along the Raritan River. That effort has had significant success.

As a result of the Raritan River effort, the DEP announced yesterday (April 21) the approval of a privately-funded \$13.2 million PCB cleanup at the Hatco Site in Woodbridge Township and the preservation of a separate 34-acre parcel to compensate the state for injuries to natural resources.

For the Delaware River initiative, the DEP will examine other sites it will add to the initial 10 that are targeted today.

Reporters can obtain details on the 10 Delaware River sites' locations, responsible companies, history and other information by calling the New Jersey Department of Environmental Protection at 609-984-1795.

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10 LOWER DELAWARE RIVER INITIATIVE SITES

Lail Property, East Greenwich and Paulsboro, Gloucester County

Action: DEP is directing ExxonMobil to remove PCB contamination immediately at this site and to sign an administrative consent order (ACO) with DEP that includes specific timeframes for completing the remedial work. In addition, DEP terminated a voluntary oversight document (Memorandum of Agreement) that ExxonMobil previously signed committing to do cleanup work at this site. PCBs have been confirmed within the site's sediments, upland soils, surface water and in fish in the area. ExxonMobil Corporation is the current owner of the site, where wetlands connect with Mantua Creek that flows into the Delaware River.

DuPont Chambers Works Facility, Pennsville and Carney's Point, Salem County

Action: DuPont will perform an evaluation of its ongoing testing and cleanup work within 90 days and execute a new oversight document (between DEP and DuPont) to reflect new strategies to improve this effort. DuPont will focus on treatment or removal of sources of contamination, optimization of its ground water contamination recovery and treatment system and enhanced testing ground water monitor wells. These actions will also address any discharge of contaminated ground water and surface water to the Delaware River and its tributaries. The DuPont Chambers Works/Carney's Point Works Site is a complex multi-product facility that employs approximately 1,000 people and currently produces hundreds of finished products on 1,455 acres.

Matlack Inc., Woolwich, Gloucester County

Action: DEP is seeking court access to the site to assess a ground water treatment system built by Matlack in 1995. Matlack filed for Chapter 11 Bankruptcy in March 2001. DEP plans to restart the treatment system depending on its current condition. DEP also will conduct off-site sampling of a local stream that is adjacent to the site and nearby private drinking water wells at four homes. The 31-acre Matlack, Inc. Swedesboro Terminal was a tank-trailer cleaning facility and truck terminal. Grand Sprute Run, near the site's western boundary, drains into Raccoon Creek, a tributary to the Delaware River. DEP will supplement public funds with a \$2 million Letter of Credit from the company it drew down in 2001.

Matteo Iron & Metal Site, West Deptford, Gloucester County

Action: DEP requested in 2005 that the EPA perform an emergency cleanup to address elevated levels of lead and PCBs in soil and in sediments of the Hessian Run that flows to the Delaware River. The responsible parties for the site have not come forward to conduct any remedial work to date, so it is being performed with public funds. During past testing, DEP identified approximately 80,000 cubic yards of buried waste, 58,000 cubic yards of

contaminated soil and 18,000 cubic yards of contaminated sediment on or adjacent to the site. The 80-acre Matteo Iron & Metal site was an unregistered landfill and battery disposal facility. The site was also used as a lead melting facility from 1971 to 1985. DEP remedial work completed to date at the site includes a preliminary assessment/site investigation, remedial investigation, aquatic biota study and a remedial alternative selection evaluation.

Sunoco Eagle Point, West Deptford, Gloucester County

Action: Sunoco will submit a plan within 30 days to investigate and address any petroleum impacts to the Delaware River or wetlands at the site as well as potential off-site migration of any related contamination. There is extensive ground water contamination at the site. Impacts to surface water include one known impact to the Delaware River in the area of Lake Caviezel. Another concern is protection of the Upper Potomac-Magothy-Raritan aquifer that lies beneath the site. The Eagle Point site is a 1,000-acre oil refinery on the Delaware River, 550 acres of which is the active production area where crude oil is processed into various gaseous and liquid fuels and other petrochemical products. Sunoco purchased the site in January 2004 and currently operates the facility.

Camden Coke Plant, Camden City, Camden County

Action: PSEG Services Corporation will develop a proposal for the treatment and removal of contamination within sediments of the Delaware River immediately adjacent to the former Camden Coke Plant site. The sediment immediately adjacent to the site contains waste including polynuclear aromatic hydrocarbons and metals due to former site operations. The contaminated sediments are located mainly within a large dock area. The Camden Coke Plant encompasses 28 acres and was constructed in 1903, operating until 1959 when the plant was dismantled. PSEG, a former owner of the coke plant, has taken the leading roll in the remedial effort at the site.

LANDFILL SITES:

The proper capping and closure of landfills is key in preventing contaminated surface water runoff and minimizing the amount of leachate generated, thus reducing pollution to the Delaware river.

DuPont Repauno Landfill, Gibbstown, Gloucester County

Action: DEP will issue a final closure approval for this landfill in July 2005. Closure work by DuPont is nearing completion. The landfill is a 14-acre facility that ceased operations in 1989. The Delaware River bounds the landfill to the north; the Clonmell Creek to the south and west; and the adjacent Hercules property to the east

Pennsville Township Sanitary Landfill, Pennsville, Salem County

Action: DEP will issue final closure approval in August 2006. The town will complete capping the landfill in January 2006 and certify this work by July 2006. The 25-acre Pennsville Township Sanitary landfill received municipal waste and ceased operation in April 1988. The township plans to use a portion of the landfill for limited recycling and composting activities upon implementing the approved closure activities.

Pennsauken Landfill, Pennsauken, Camden County

Action: DEP will issue final closure approval in June 2005. The Pollution Control Authority of Camden County installed an impermeable landfill cap in November 2004. The authority will submit plans for a ground water treatment system by August 2005. The Pennsauken Landfill consists of three adjacent facilities: one operating, one closed properly and one subject to action under the Delaware River Initiative, called the "A" landfill. The "A" landfill is the only one that is unlined and is a source of ground water pollution. It originally operated as a sand and gravel pit and began to accept waste in the 1960s until it closed in 1982.

Salem City Landfill, Salem City, Salem County

Action: DEP will issue final closure approval for this landfill in October 2005. The city capped the landfill in 2004 and will complete final seeding in July 2005. The 33-acre landfill operated as a municipal landfill for many years until its operations ceased in 1986.

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EPA REGIONAL GUIDANCE DOCUMENTS

The following documents are available for public review at the EPA Region II Field Office, 2890 Woodbridge Avenue, Edison, New Jersey 08837 during regular business hours.

- * Glossary of EPA Acronyms.
- * Superfund Removal Procedures--Revision #3. OSWER Directive 9360.0-03B, February 1988.
- * Hazardous Waste Operations and Emergency Response.
Notice of Proposed Rule making and Public Hearings.
29 CFR Part 1910, Monday, August 10, 1987.
- * Guidance on Implementation of Revised Statutory Limits on Removal Action. OSWER Directive 9260.0-12, May 25, 1988.
- * Redelelegation of Authority under CERCLA and SARA.
OSWER Directive 9012.10, May 25, 1988.
- * Removal Cost Management Manual.
OSWER Directive 9360.0-02B, April, 1988.
- * Field Standard Operating Procedures (FSOP).
#4 Site Entry.
#6 Work Zones.
#8 Air Surveillance.
#9 Site Safety Plan.
- * Standard Operating Safety Guides -- U.S. EPA Office of Emergency and Remedial Response, July 5, 1988.
- * CERCLA Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund).
- * SARA: Superfund Amendments and Reauthorization Act of 1986.
- * NCP: National Oil and Hazardous Substances Pollution Contingency Plan. - Publication No. 9200.2-14.
- * Guidance on Implementation of the "Contribute to Efficient Remedial Performance" Provision - Publication No. 9360.0-13.

Additional Guidance Documents are listed below and are available for review at the EPA Region II Removal Records Center.

- * The Role of Expedited Response Actions (EPA) Under SARA - Publication No. 9360.0-15.
- * Guidance on Non-NPL Removal Actions Involving Nationally Significant or Precedent Setting Issues - Publication No. 9360.0-19.
- * ARARS During Removal Actions - Publication No. 9360.3-02.
- * Consideration of ARARS During Removal Actions - Publication No. 9360.3-02FS.
- * Public Participation for OSCs - Community Relations and the Administrative Record - Publication No. 9360.3-05.
- * Superfund Removal Procedures - Removal Enforcement Guidance for On-Scene Coordinators - Publication No. 9360.3-06.
- * QA/QC for Removal Actions - Publication No. 9360.4-01.
- * Compendium for ERT Air Sampling Procedures - Publication No. 9360.4-05.